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YARWOOD (C. E.) & COHEN (M.). **Hypertrophy from the uredial stage of Bean rust.** —*Bot. Gaz.*, 112, 3, pp. 294–300, 1 fig., 4 graphs, 1951.

The uredo stage of *Uromyces phaseoli typica* [*U. appendiculatus*: *R.A.M.*, 28, p. 350; 29, p. 471] was maintained at the University of California in greenhouse cultures and on detached leaves of bean (*Phaseolus vulgaris*) for twelve years without host hypertrophy being observed. This was manifested, however, in the uredo stage on the variety Pinto by concavities or convexities in the areas of localized light or heavy inoculations of primary leaves, by visible increases in the total growth of infected primary leaves when compared with that of healthy leaves, and as measurable increases in total growth of leaves when whole plants were inoculated.

ADAMS (A. F. R.). **Copper deficiency of Onions grown on peat. II.**—*N.Z. J. Sci. Tech.*, A, 31, 3, pp. 34–40, 2 figs., 1949. [Received January, 1951.]

In the vegetable-growing area of Marshland, near Christchurch, New Zealand, where onions on peat soil were affected by copper deficiency [*R.A.M.*, 29, p. 244], the condition reached serious proportions only in a limited area, but was present elsewhere in a much less severe form in isolated pockets. There was often conspicuous variation in intensity of attack in a small area.

In a further trial four treatments were applied: (*a*) no added copper; (*b*) two foliar applications with a watering-can (23rd October and 12th December) of 0·25 per cent. copper sulphate in water with a wetting agent, each equivalent to 20 lb. copper sulphate per acre; (*c*) and (*d*) soil dressings of powdered copper sulphate at 200 and 56 lb. per acre, respectively, broadcast before sowing. The ratios of mean treatment yields (bulbs) from all plots for these treatments, respectively, were 100, 870, 510, and 220, while grading through a 1½ in. square grid gave the following relative marketable yields, respectively: 100; 2,710; 1,290; and 310. The same beneficial effect should be obtained with a much reduced volume of spray of the same strength, provided good coverage was ensured. Most growers, however, probably prefer broadcasting.

CAMPACCI (C. A.). **A 'ferrugem' do Alho.** [The 'rust' of Garlic.]—*Biológico*, 16, 9, pp. 185–187, 1 fig., 1950.

Garlic crops in São Paulo, Brazil, suffer heavy damage every year from rust (*Puccinia allii*) [*R.A.M.*, 27, p. 462; 29, p. 333], which should be combated (1) by cultural methods, such as four- to five-year crop rotation, soil drainage, sparing use of organic manure, procurement of seed from healthy plantings, and cultivation of resistant varieties like Caiano Roxo; and (2) the application of 1 per cent. Bordeaux mixture, beginning at or even before the first symptoms of infection and continuing at weekly, ten-day, or fortnightly intervals according to the prevailing weather conditions.

Schmidt (Trude). **Die Sclerotinia-Krankheit des Salates — eine immer mehr überhandnehmende Krankheit.** [The *Sclerotinia* disease of Lettuce—a progressively increasing disease.]—*Pflanzenarzt, Wien*, 3, 7, pp. 1–2, 1950.

This is a popular note on the steadily increasing depredations of *Sclerotinia* [*minor*] in Austrian market-gardens [*R.A.M.*, 29, p. 404]. The remedy should be sought in rational crop rotation to prevent the accumulation of sclerotia in the soil. These organs can be thoroughly eliminated only by steam sterilization, for which the majority of gardens have no facilities, but soil treatment with brassicol [ibid., 28, p. 554] promises a measure of success. Frequent change of site is all the more important in view of the difficulty of direct control.

Hellmers (E.). **Angular leaf spot of Cucumbers (Pseudomonas lacrymans (Smith & Bryan) Carsner) in Denmark.**—*Trans. Dan. Acad. tech. Sci., 1950*, 9, 28 pp., 14 figs., 1950.

Pseudomonas lacrymans has probably been present on cucumbers in Denmark [*R.A.M.*, 4, p. 285] for a number of years, but its identity was not definitely established until 1949, when the author succeeded in isolating the bacterium in pure culture on meat-peptone agar from angular, pale fawn to flaxen, shrivelled lesions, 1 to 8 mm. in diameter, sometimes merging into large, necrotic blotches, on leaves of the outdoor variety Langelands Kaempe (Giant). Inoculation experiments on the leaves and fruits of several varieties resulted in the development of typical symptoms. Apart from a few minor discrepancies in biochemical reactions, the Danish isolates of *P. lacrymans* are in close agreement with published descriptions of the organism from the United States (*J. agric. Res.*, 5, pp. 465–475, 1915) [cf. *R.A.M.*, 10, p. 287 *et passim*] and Germany [ibid., 13, p. 419]. In a small test inoculated plants of the Butchers and Langelands Kaempe varieties remained healthy after spraying with 1 per cent. Bordeaux plus 0·5 per cent. resin soap, while unsprayed plants were completely destroyed in 14 days.

Jacob (H. E.) & Winkler (A. J.). **Grape growing in California.**—*Circ. Calif. agric. Ext. Serv.* 116, 80 pp., 27 figs., 1950.

In the section dealing with vine diseases in California (pp. 57–63) details of distribution, symptoms, and control are given. Powdery mildew [*Uncinula necator*: *R.A.M.*, 8, p. 700; 19, p. 25, *et passim*] is present in every vine-growing region of the State. Pierce's disease [lucerne dwarf virus: ibid., 30, p. 303] is also present in every important vineyard and has assumed epidemic proportions in some local areas. Mosaic (virus) [ibid., 30, p. 304] occurs in several areas. Dead arm [*Cryptosporella viticola*: ibid., 26, p. 528] is present in nearly all grape-growing sections. Spraying or swabbing against black measles [ibid., 5, p. 467; 28, p. 376] with sodium arsenite should be delayed until the following year if the vines do not become completely dormant. The spray may be applied either before pruning early in December, but at least three weeks after the first killing frost, or at least three weeks after pruning, that is, late in January or February before the buds swell. Crown gall [*Bacterium tumefaciens*: ibid., 30, p. 144] is serious only when the trunks and branches have been cracked by freezing. The treatment used for black measles will kill the galls.

Collar rot, caused by one or more species of water mould fungi [cf. ibid., 28, p. 437], is most prevalent in vineyards up to four or five years old and is seldom found in older ones. The causal fungi are favoured by wet soil [cf. ibid., 18, p. 11] and usually enter the tissues near the crown in early spring. They kill the cambium and the bark, forming dead cankers which often circle the trunk for three to six in. near ground level. Diseased vines should be replaced.

Armillaria root rot [*A. mellea*: cf. ibid., 6, p. 460; 9, p. 360; 17, p. 653; 25, p.

436] appears to be native to California, where it occurs in several localities. Control consists in removing all vine trunks and roots to a depth of 12 in., pulverizing the surface to form a loose mulch, wetting it 2 or 3 in. deep, and injecting carbon disulphide 6 to 8 in. deep into holes 18 in. apart, staggered in rows 18 in. apart. Two oz. by weight or $1\frac{3}{5}$ oz. by volume are placed in each hole, which is then plugged with soil. The whole surface is then firmed and re-wetted. If the roots go deeper than 5 feet the dosage should be increased. Treated areas may be replanted the following spring.

Little leaf [ibid., 22, p. 7; 26, p. 43] may be controlled on spur-pruned vines by promptly painting or swabbing the pruning cuts with zinc sulphate [loc. cit.]; no satisfactory control is known for cane-pruned vines.

GALLAY (R.), STAEHELIN (M.), WURGLER (W.), & LEYVRAZ (H.). **La dégénérescence infectieuse de la Vigne. Les effets de la maladie sur le développement et le rendement de jeunes Vignes en seconde année de plantation.** [Infectious degeneration of the Vine. The effects of the disease on the development and yield of young Vines during the second year after planting.]—*Rev. romande Agric., Vitic., Arboric.*, 6, 11, pp. 81–84, 1950.

During 1950, observations were continued in the three experimental vineyards laid down in 1949 at Pully, La Côte, and Lavaux, Switzerland, for the study of infectious degeneration [court-noué: *R.A.M.*, 30, p. 137]. In all three, all the vines taken from diseased Chasselas at La Côte and Lavaux, whether grafted on Riparia × Rupestris 3309 or Riparia × Berlandieri 5C were weaker in growth than those from healthy material from Pully. The branches were shorter and leaf malformations were present. Fasciation and double nodes were much more prevalent on affected Chasselas than on Chasselas from Pully. Variegation appeared in 1950 on affected vines from Lavaux and on one previously healthy Chasselas from Pully, and was more prevalent in Chasselas on Berlandieri 5C than on Rupestris 3309. The number of fruit bunches was greatly reduced on the affected vines and further loss of yield resulted from non-setting.

New sites of infection have recently been found in Switzerland, and there is some evidence that the disease may be able to infect the soil [ibid., 26, pp. 226, 227; 29, p. 75]. In the vineyard at La Côte (planted where affected vines had previously grown) development is more precarious than in the corresponding plots in the other two vineyards.

NICKELL (L. G.). **Effect of certain dyes on the growth in vitro of virus tumor tissue from Rumex acetosa.**—*Bot. Gaz.*, 112, 3, pp. 290–293, 2 graphs, 1951.

In studies at the Brooklyn Botanic Garden, New York, methylene blue, crystal violet, and malachite green at concentrations above 0·01 p.p.m. inhibited growth in culture of virus tumour tissue from roots of *Rumex acetosa*. Neutral red was about 20 per cent. inhibitory at 0·1 p.p.m. and over. The effect of the dyes was not permanent.

JOHNSON (J.). **Virus particles in various plant species and tissues.**—*Phytopathology*, 41, 1, pp. 78–93, 6 figs., 1951.

At the Wisconsin Agricultural Experiment Station a water pressure method was used [*R.A.M.*, 28, p. 25] to obtain clear exudates from some 50 species of plants infected with about 35 viruses. Examination of these drops with the electron microscope revealed rod-like particles typical of the tobacco mosaic virus [ibid., 26, p. 267; 30, p. 305] in 30 species in 16 genera infected with the virus, of which six were non-solanaceous, namely, carrot, *Digitalis lanata*, *Eryngium aquaticum*, *Phlox drummondii*, *Plantago major* [cf. ibid., 27, pp. 161, 162], and *Zinnia elegans*. In carrot and *Z. elegans* the virus was present at low concentrations only. These

species also contained the yellow strain of the virus. Good rod-shaped particles were also found associated with several other viruses, e.g., those of *Amaryllis* mosaic in *Hippeastrum* [ibid., 8, pp. 19, 117], a mosaic of crimson clover, cucumber virus 4 [? strain of cucumber green-mottle mosaic: ibid., 29, p. 480], carnation mosaic [ibid., 29, p. 563], pea mosaic [ibid., 26, p. 1], potato virus X in potato and *Datura stramonium* [ibid., 28, p. 28], potato ring spot [potato virus X] in *Nicotiana rustica* [ibid., 26, p. 75], tobacco streak in tobacco and maize, and sometimes tobacco ring spot. The shape and size of the particles, which occurred in nearly all the tissues, were more variable among the different viruses than in strains of tobacco mosaic virus on different hosts or plant organs. Few or doubtful rod-like particles were found associated with the viruses of lucerne mosaic [ibid., 28, p. 18], cucumber mosaic and yellow cucumber mosaic [strain of cucumber mosaic] on tobacco [ibid., 28, pp. 37, 42], *Gladiolus* mosaic [ibid., 23, p. 488], tobacco etch [ibid., 29, pp. 139, 403] and yellow ring spot [strain of tobacco ring spot], and turnip mosaic in horse-radish [ibid., 30, p. 297]. Rod-shaped particles were absent in the vascular contents of plants infected with 19 other virus diseases.

The number of virus particles observed under the microscope was often roughly proportionate to the number of local lesions obtained on a suitable host, but this correspondence was not equally pronounced in all species or organs. Quantitatively, the particles are normally immensely in excess of the infectious units as measured by the local lesion method on a highly sensitive host, *N. tabacum* × *N. glutinosa*.

Considering the variable dimensions and form of the particles, their numbers relative to infectious units, and their similarity in parallel aggregation to striated crystalline plates visible under the light microscope, it seems improbable that they represent the ultimate infectious unit of the virus. At high electron microscope magnification and by means of uranium shadow-casting, the tobacco mosaic virus rods resemble a row of thick disks or spheres. These and other observations, such as the absence or rarity of detectable particles in similar viruses, suggest that the rod-like structures under discussion may be the result rather than the cause of disease.

Report of the Minister of Agriculture for Canada for the year ended March 31st, 1950.—287 pp., 1950.

Most of the information in the section dealing with plant pathology (pp. 42–78) in this report has been noted from other sources [*R.A.M.*, 30, pp. 30, 307, 360, *et passim*].

Progress Report, Dominion Experimental Station, Summerland, British Columbia, 1937–1948.—101 pp., 28 figs., 3 diags., 1951.

In this report A. J. Mann and F. W. L. Keane (pp. 23–32) state that inoculation tests showed the apple varieties Delicious, Newtown, and Spartan to be resistant to crown rot (*Phytophthora cactorum*) [*R.A.M.*, 29, p. 263]. A high percentage of the seedlings of Antonovka, Columbia Crab, Dolgo Crab, and *Pyrus robusta* were also resistant. The pear framework stocks Farmingdale, Old Home, and Variolosa are resistant to fireblight [*Erwinia amylovora*: cf. ibid., 17, p. 49; 30, p. 307, *et passim*]. The disease was allowed to spread unchecked in a block of Old Home stocks top-worked with Bartlett, Flemish Beauty, and similar varieties. Infection spread down the branches until it reached the stock, when it became arrested. The affected limbs were sawn off and the Old Home frameworks re-grafted with desired commercial varieties. The grafts made rapid growth and the trees were soon back in bearing. In localities where blight is serious the use of Old Home as a framework for standard varieties is recommended.

J. E. Britton and D. V. Fisher (pp. 42–50) state that apple bitter pit [ibid.,

30, p. 16] was particularly prevalent in the Okanagan Valley from 1937 to 1940, since when it has not caused serious losses. It was most serious in the years immediately following the severe winters of 1935–6 and 1936–7, which caused considerable injury to trees in some orchards. Trees with a heavy crop are seldom affected, whereas those in their 'off-year', or young trees frequently produce pitted fruits. Light and heavy crops should be harvested separately and light crops kept in cold storage for eight weeks before packing to ascertain whether the condition will develop. Newtown apples should never be picked less than 155 days from full bloom.

In some parts of the Pacific Northwest pear black end [ibid., 17, p. 693] causes losses of up to 20 per cent.; in the Okanagan Valley losses are largely confined to the Bartlett variety, in which they range from 0 to 50 per cent. according to the orchard, individual tree, and season. No affected tree recovers completely. There is some evidence that black end becomes less serious as orchard conditions and tree vigour improve. The most seriously affected fruits are usually on the inside of the tree, and these should be removed at thinning.

Mehta (P. R.), Garg (D. N.), & Mathur (S. C.). **Important diseases of food crops, their distribution in India and Uttar Pradesh.**—*Tech. Bull. Dep. Agric. U.P.* 2, 13 pp., 1950.

This useful bulletin presents a tabulated list of fungal and virus diseases of food crops in India and Uttar Pradesh [*R.A.M.*, 27, p. 314], their distribution in the region, time of appearance, severity, and estimated losses they cause in U.P. Resistant varieties are included. Some of the more important and widespread diseases are *Sclerotium oryzae* [*Leptosphaeria salvinii*: ibid., 15, p. 313; 20, p. 447] on rice; *Puccinia glumarum* [ibid., 27, p. 314; C.M.I. map No. 97] and *P. rubigo-vera tritici* [*P. triticina: R.A.M.*, 27, p. 358] on wheat, the varieties N.P. 4 and N.P. 165 being resistant to both, rusts and Pb–9d to the former; *Ustilago hordei* [ibid., 26, p. 144] (to which CN 294, K 12, and C 84 are resistant) and *P. glumarum* on barley; *Fusarium orthoceras* var. [*ciceri*: ibid., 29, p. 223] on gram [*Cicer arietinum*], to which 4313–2 and T87 were resistant in one year's field trials; *Alternaria brassicae* [ibid., 27, p. 196] on crucifers (all *Brassica nigra* and *B. juncea* varieties are resistant); *Vermicularia* [*Colletotrichum*] *capsici*, causing fruit rot of eggplant [ibid., 26, p. 141]; and *Cercospora arachidicola* [C.M.I. map No. 166] and *S. rolfsii* [*R.A.M.*, 29, p. 12] on groundnut, the varieties 1, 6–2, 11–11, 13, 14, 15, 16–4, 17, 19, 22, 25, 26, 4201, RB2, and RB3 being resistant to the last-named.

Inlichtingen en onderzoekingen van de Afdeling Tropische Producten in 1950. [Information and investigations of the Department of Tropical Products in 1950.]—*Meded. Inst. Trop. Amst.* 95, 52 pp., 4 figs., 1951. [English summary.]

The following items of phytopathological interest occur in this report (pp. 36, 39). A sample of kapok (*Ceiba pentandra*) from the Ivory Coast was found to be infected by *Cladosporium herbarum*, which had penetrated both between the fibres and into the lumen, and by *Rhizopus arrhizus* and *Penicillium islandicum* [*R.A.M.*, 28, p. 24]. The first-named mould was responsible for heavy damage in the form of black spots, its spores having presumably contaminated the fibres during storage under somewhat humid conditions.

According to a statement in *Versl. Dep. Landb. Suriname*, p. 22, 1946 to 1948, spoilage of citrus fruits in Surinam is attributable mainly to *Penicillium digitatum*, *Diaporthe citri*, and *Diplodia natalensis*. A factory has been erected by the 'Surinam Citrus Centrale' at Paramaribo for the processing and disinfection of oranges and grapefruit for export. Local consumption accounts for some 20,000,000 fruits annually, while nearly as many are sent abroad.

Theis (T. N.), Riker (A. J.), & Allen (O. N.). **The destruction of crown-gall bacteria in Periwinkle by high temperature with high humidity.**—*Amer. J. Bot.*, 37, 10, pp. 792–801, 5 figs., 1950.

In studies at the University of Wisconsin the A-6 strain of *Agrobacterium* [*Bacterium*] *tumefaciens*, originally isolated from raspberry and purified by mechanically picked single cells [*R.A.M.*, 10, p. 167], and Braun's peach strain [ibid., 23, p. 128] were used for treatment of experimentally inoculated plants in a specially constructed heat chamber. Preliminary tests had shown that water-bath heat treatment of the bacteria in a yeast-water nutrient medium at 45° C. for 24 hrs. was sufficient to kill the organisms, and that the bacteria did not survive 24 hrs. at 46·5° in extracted sap of periwinkle (*Vinca rosea*). Ninety-six-hour broth cultures and agar slant cultures were heat-treated at 46·5°, after which inoculations to tomato plants were made every 24 hours. Only a few tubes showed growth after 24 hours' heat; such cultures were all pathogenic. No bacteria survived more than 48 hours' heat.

Viable pathogenic bacteria were recovered from inoculated periwinkle plants held at 48·5° for five days at 40 to 50 per cent. relative humidity. The internal plant temperatures were about one degree less than those of the heat chamber. The plants barely survived this temperature and were killed at 49·5°. Varying the pre-heat treatment incubation periods after inoculation did not alter the results, but affected the size of the galls. Inoculations with washed cells gave similar results. Complete elimination of the bacteria in inoculated plants was obtained with a relative humidity above 65 per cent. during treatment at 46·5°, but the galls became contaminated with fungi, chiefly a *Penicillium* sp., which inhibited *Bact. tumefaciens* in culture. When surface-sterilized periwinkle stems were inoculated, incubated in glass cylinders for four days, and treated at 46·5° for three days at 85 per cent. relative humidity the galls which developed were free from bacteria and fungi.

Kelman (A.) & Jensen (J. H.). **Maintaining virulence in isolates of Pseudomonas solanacearum.**—*Phytopathology*, 40, 2, pp. 185–187, 1951.

This is a slightly fuller account than that already noticed [*R.A.M.*, 30, p. 313] of work at the North Carolina State College on the maintenance of virulence of isolates of *Pseudomonas* [*Xanthomonas*] *solanacearum*, which normally undergoes a relatively rapid loss of pathogenicity in culture, from diseased potato [ibid., 26, p. 147; 28, p. 479], tobacco [ibid., 27, p. 390], and groundnut [ibid., 11, p. 621] by storing potato dextrose agar slants under sterile mineral oil at about 25° C.

Vasconcellos (J. de C.). **La planta de Trigo. Morfología y fisiología.** [The Wheat plant. Morphology and physiology.]—xi+201 pp. 2 col. pl., 80 figs., Instituto Nacional de Investigaciones Agronómicas, Madrid, 1950.

This is an amplified Spanish translation by R. Téllez Molina of an important Portuguese monograph on the wheat plant, including chapters on the diseases affecting the crop at different stages of growth.

Thomas (I.) & Watson (E. R.). **New cereal varieties in Australia—1948–49.**—*J. Dep. Agric. W. Aust.*, Ser. 2, 27, 3, pp. 269–272, 1950.

Short descriptions are given of the seven wheat varieties already noticed from the Waite Agricultural Research Institute, South Australia [*R.A.M.*, 28, p. 622]. Each is resistant to races 126 and 126B of stem rust (*Puccinia graminis tritici*), but susceptible to the new complex of races isolated in New South Wales in 1948. The new varieties Curlew and Brolga, submitted for registration during 1948 to 1949 by the New South Wales Department of Agriculture, both resist flag smut

[*Urocystis tritici*: ibid., 29, p. 610], but are susceptible to stem rust and leaf [brown] rust [*P. triticina*]. The former originated from the cross (Bobin × Dundee) × Gular, and the latter from Bobin × Dundee.

Cherewick (W. J.). **Physiologic specialization in cereal smuts.**—Abs. in *Phytopathology*, 41, 1, p. 7, 1951.

During the past four years over 1,000 cereal smut collections have been subjected to identification tests on a series of differential hosts at the Dominion Laboratory of Plant Pathology, Winnipeg, Canada. On the basis of these and previous tests the following numbers of physiologic races have been identified: *Ustilago hordei* [*R.A.M.*, 24, p. 143] 13, *U. nigra* [ibid., 22, p. 351] 11, *U. nuda* [ibid., 8, p. 297] and *U. tritici* [ibid., 27, p. 227] 10 each, *U. kolleri* [ibid., 22, p. 342] 4, and *U. avenae* [ibid., 27, p. 180] 17. The addition of the Mabel and Beacon oat varieties to the ten selected by Holton [ibid., 12, p. 622] and Rodenhiser [ibid., 8, p. 297] increases the number of races of the two last-named smuts to 10 and 23, respectively. Similarly, the addition to Tapke's group [see next abstract] of the White Hulless and Nawal barley varieties raises the number of races of *U. hordei* and *U. nigra* to 16 and 14, respectively. Three races of *Tilletia caries* and two of *T. foetida* on wheat [ibid., 30, p. 364] have been identified.

Tapke (V. F.). **New physiologic races of Ustilago nigra from the United States and Israel.**—*Phytopathology*, 41, 2, pp. 139–141, 1951.

During the winter of 1945–6, 16 collections of *Ustilago nigra* isolated from barley in Israel [*R.A.M.*, 24, p. 185] were increased in the greenhouse and then used in a co-operative study of the Plant Industry Station, Beltsville, Maryland, and the New York (Cornell) Agricultural Experiment Station on the nine physiologic races of the smut now present in the United States [ibid., 22, p. 351]. The new U.S. races 8 and 9 were collected once only in Missouri and Ohio, respectively. The Israeli collections yielded six races, four of which (10, 11, 12, and 13) have not yet been found in the United States, while the other two resemble the American races 4 and 6. Races 11, 12, and 13 proved to be pathogenic to Pannier, which has been immune from all the nine known U.S. races.

The reactions of eight differential varieties of barley, namely, Odessa, Trebi, Hannchen, Lion, Himalaya, Nepal, Excelsior, and Pannier, to the nine U.S. and four Israeli races of *U. nigra* are presented. Race 13 is the only one capable of attacking all the varieties, and it is evident, therefore, that barley seed from Israel may be a dangerous source of black smut infection. In a comparative investigation of the incidence of infection the damage was lighter in the field than in the greenhouse, where the tests emphasized the low susceptibility of Trebi to several races, which was not apparent in the field.

Henry (A. W.), Peterson (E. A.), Millar (R. L.), & Horricks (J. S.). **Control of covered smut of Oats by seed treatment with an antibiotic.**—*Science*, 113, 2936, p. 390, 1951.

In experiments carried out during 1950 at the University of Alberta on the control of oat covered smut (*Ustilago kolleri*) by seed treatment with actidione [cf. *R.A.M.*, 29, p. 451] and streptomycin, the former at a concentration of 10 p.p.m. in water (four hours' treatment) gave almost complete control (average 0·2 per cent. smutted plants) and caused no significant injury to the seed. Following streptomycin sulphate (1,000 p.p.m.), however, 12·9 per cent. infection developed. Ceresan M (½ oz. per bush.) and panogen 8 (0·12 ml. per 50 gm. seed) both gave complete control, while formaldehyde (1 in 320 for two minutes) gave 3·7 per cent. infection, suggesting that the sample of oats used carried a rather persistent type of infection (controls, soaked 16·6 per cent. infection, dry 10·8).

Actidione reduced barley covered smut [*U. hordei*: ibid., 30, p. 101] significantly with no appreciable injury to the seed, but streptomycin caused no reduction.

When used against wheat covered smut [bunt: *Tilletia foetida* and *T. caries*] both antibiotics significantly reduced emergence, streptomycin causing very serious seed injury. Complete control was given by actidione, but infection in the control plots was only 2 to 4 per cent.

McKinney (H. H.). **A seed-borne virus causing false-stripe symptoms in Barley.**—*Plant Dis. Reptr*, 35, 1, p. 48, 1951. [Multilithed.]

Leaves of Chevron and Mars barley from a nursery at St. Paul, Minnesota, exhibited in the summer of 1950 false stripe symptoms strikingly similar to those on Chevalier barley collected in 1913 by A. G. Johnson at Wisconsin Agricultural Experiment Station, Madison. Inoculations with extracts from the affected leaves demonstrated a virus which is probably new. It caused systemic infection and local lesions in all Chevron, Mars, Brandon, and Oderbrucker barley seedlings, Michigan Amber wheat, Golden Giant sweet corn, crab grass (*Digitaria ischaemum*), and to a lesser degree in the smooth brome grass seedlings (*Bromus inermis*). In wheat and sweet corn the symptoms consisted of light yellow or bleached, continuous or broken stripes, rendering the leaves in some cases almost white. Later the symptoms became less severe in wheat. Some sweet corn plants were stunted, others produced new foliage free of symptoms; no seedlings were killed. In barley, crab grass and some of the brome grass the brown, necrotic stripes were typical of false stripe, but the chlorotic markings predominated.

Seed from infected Chevron plants gave rise to 132 virus-infected ones out of 226 grown.

Earhart (R. W.). **Helminthosporium crown and culm rot of Southland Oats.**—Abs. in *Phytopathology*, 40, 1, p. 11, 1951.

A new variety of oats, Southland (C.I. 5207), released by the Florida Agricultural Experiment Stations, sustained severe damage from lodging in 1949 to 1950. In one field the symptoms on the crown and lower section of the culms on half the crop resembled those caused by *Helminthosporium victoriae* [*R.A.M.*, 30, p. 151], although the affected variety had been resistant in previous tests. A species of *Helminthosporium* with small, dark spores with thick, tapered walls, which was consistently isolated from the diseased plants, was morphologically similar in certain respects to *H. victoriae* and in others to *H. sativum*, but it did not agree with either of these species in pathogenicity. Severe infection resulted from foliar inoculation, the leaves being completely destroyed in four to seven days. Like *H. victoriae*, the species isolated from Southland generally induced severe necrosis and imparted a withered or scorched appearance to the foliage.

Pichler (F.). **Über Roggensteinbrand (Tilletia tritici f. sp. secalis).** [On Rye bunt (*Tilletia tritici* f. sp. *secalis*).]—*PflSch. Ber., Wien*, 5, 5–6, pp. 273–286, 1950. [English summary.]

For the last few years rye crops in the Austrian Alps have sustained considerable damage from bunt (*Tilletia tritici* f.sp. *secalis*) [*T. secalis*: *R.A.M.*, 28, p. 377], the development of which is usually sporadic and largely dependent on meteorological conditions [ibid., 3, p. 389; 5, p. 509]. The spores of *T. secalis* could not be induced to germinate on any of the artificial media tested [ibid., 19, p. 12].

The average dimensions of four Alpine collections (100 spores each) of *T. secalis* from rye ranged from 21·2 to 21·7 μ in diameter and the height of the ridges from 1·6 to 2 μ. The spores of two collections of *T. secalis* on wheat (1947 and 1949) measured 20·6 and 17·6 μ, respectively, and the ridges 1·9 and 0·9 respectively.

For three collections of wheat bunt the measurements were 18·1 to 20·6 μ and 0·8 to 1·7 μ, respectively.

Infection of rye by *T. secalis* seldom results from dusting the seed with spores but appears to be transmitted only through the soil under conditions which have not yet been determined. The seed treatments of proved efficacy in wheat bunt control have hitherto been more or less ineffectual against *T. secalis* on rye. The inoculation of rye with wheat bunt spores caused slight infection. *T. caries* spores from rye resemble those of *T. secalis* in their germination relations and pathogenicity. The author's studies support the view that rye bunt is a specialized form of wheat bunt [ibid., 10, pp. 372, 590]; it is similar to dwarf bunt of wheat [ibid., 28, p. 388; 29, p. 295, *et passim*] in many respects.

Le Conte (J.). **Réunion des experts du Maïs à Clermont-Ferrand (23 au 27 janvier 1951).** [Conference of Maize experts at Clermont-Ferrand 23rd to 27th January, 1951.]—*Agron. trop.*, 6, 3–4, pp. 179–185, 1951.

At this conference it was stated that at Beltsville [Maryland], maize lines resistant to *Helminthosporium* [*turcicum*: *R.A.M.*, 29, p. 361; 30, p. 225] are developed by crossing the highly susceptible Hy with the highly resistant N.C. 34 [ibid., 29, p. 505]. The resulting hybrids are then back-crossed three times with Hy and about 250 of the progeny are artificially inoculated in experimental plots. For two generations the ten most resistant plants are pollinated with a mixture of pollen from all ten plants. In the third generation a new Hy line resistant to *Helminthosporium* is obtained.

Studies by Hobby [P. E. Hoppe] in Wisconsin have shown a correlation between facility in raising maize plants and the presence of micro-organisms in the soil. He found, by sowing certain races of *Pythium* [ibid., 29, p. 360], that emergence depended upon the race employed and that germination was more difficult at 11° C. than at 4°, at which temperature the fungus was unable to develop. In these tests the temperatures are always raised eventually to the optimum for germination. Certain grain defects, such as cracking, are detected better at low than at normal temperatures.

Grant (T. J.) & Costa (A. S.). **A progress report on studies of tristeza disease of Citrus in Brazil. I. Behaviour of a number of Citrus varieties as stocks for Sweet Orange and Grapefruit, and as scions over Sour Orange rootstock when inoculated with the tristeza virus.**—*Proc. Fla hort. Soc.*, 61, pp. 20–33, 1949. [Received April, 1951.]

A tabulated survey is presented of the data obtained in 1948 [a preliminary report of which has already appeared: *R.A.M.*, 29, p. 300] relating to the established or suspected occurrence or absence of tristeza root rot symptoms [ibid., 30, p. 268, and next abstracts] on 345 citrus stock-scion combinations, following inoculation with the virus responsible for the disease. The studies involved the establishment near Campinas, Brazil, of two nursery plantings. The first is known as the 'stock test', in which sweet orange and grapefruit varieties are used as scions on the largest practicable number of citrus seedling stocks, while in the second or 'sour test', each of the stock varieties in the first furnishes scions for sour orange rootstocks. The Pineapple, Valencia, Florida Sweet Seedling, Hamlin, and Parson Brown sweet orange varieties have proved to be tristeza-tolerant stocks for Barão and Valencia sweet orange and Leonardy and Duncan grapefruit tops. Some lemon and tangelo varieties and the Nippon kumquat hybrid used in the trials are unsatisfactory. The divergent reactions to the virus noted in tests with the lemon, and more especially with the tangelo varieties, as well as the preliminary results in the *Poncirus trifoliata*, *P. trifoliata* × sweet orange, and *P. trifoliata* × grapefruit groups, indicate the advisability of the inclusion in the tests of known

hybrids, particularly between mandarin and sour orange and between sweet and sour oranges.

COSTA (A. S.), GRANT (T. J.), & MOREIRA (S.). **Investigações sôbre a tristeza dos Citrus. II. Conceitos e dados sôbre a reação das plantas cítricas à tristeza.** [Investigations on tristeza of Citrus. II. Concepts and data relating to the reaction of Citrus plants to tristeza.]—*Bragantia, S. Paulo*, 9, 1–4, pp. 59–80, 4 figs., 1949. [English summary. Received January, 1951.]

Although environmental factors, such as temperature, humidity, and light can influence the reaction of citrus to tristeza root rot [see preceding and next abstracts], the authors have found them to be of minor importance in comparison with the inherent qualities of the plant, especially response to infection, tendency to permit virus increase, and tolerance or non-tolerance of the tissues.

The results of tests at Campinas, São Paulo, in which various types of citrus budded on sour orange rootstocks were infested with viruliferous *Aphis citricidus* [*R.A.M.*, 28, p. 522] revealed a correlation between susceptibility to infection and severity of symptoms. Sweet oranges were the most susceptible (Barão apparently more so than Valencia) and showed severe symptoms. Mandarins, though relatively resistant, also sustained heavy damage when they did contract infection. The reactions of the tolerant tangelo (*Citrus reticulata* × grapefruit) varieties were similar to those of the sweet orange, while the non-tolerant tangelos, susceptible citranges (*Poncirus trifoliata* × sweet orange), and grapefruits reacted more or less uniformly with moderately severe symptoms, the Leonardy grapefruit being more susceptible than Duncan. A relatively high degree of resistance was shown by the pomelo, shaddock, and sour orange varieties tested. Sour oranges were more readily infected through tissue union than by means of the aphid vector. *P. trifoliata*, citrumelos (*P. trifoliata* × grapefruit), and resistant citranges were free from symptoms and no virus could be recovered even after three inoculations of the plants.

The nature of the injury caused by tristeza in the non-tolerant graft and intergraft combinations is discussed. Observations on plants consisting of a sour orange inter-stem graft between sweet orange roots and foliage appear to indicate that food translocation is not entirely precluded by the phloem collapse of the sour intergraft, the sweet stem below which continued to increase in girth at about the same rate as the sweet stem above for nearly two years in the field. However, the growth of the sour intergraft was constricted, possibly from the injurious effect of the disease on tissues other than the phloem.

The susceptibility of sour orange root tissues was indicated by the development of tristeza symptoms in sweet orange scions grafted directly on to sour orange roots and then inoculated. Rootlet and root mortality was not confined to infected plants with tolerant tops and non-tolerant rootstocks but also extended to infected tolerant plants with an inter-stem graft of non-tolerant sour orange. These observations, together with those made on mechanically ringed plants, denote that the rootlet and root symptoms of non-tolerant stocks are mostly secondary reactions despite the susceptibility of the root tissues. The virus was recovered from sprouts growing at the ends of severed roots of Caipira sweet orange stock, thereby demonstrating its presence in the rootstock of a tolerant variety.

Fifty seedling types are reported to have shown symptoms following heavy aphid infestation similar to those displayed by non-tolerant stock-scion combinations. Some symptoms developed in small sweet orange seedlings after heavy inoculations, but types with tolerant tissues showed a tendency to recovery from symptom expression.

The mode of inheritance of the principal characters involved in host reaction to the tristeza virus is discussed. Some seedling progenies of crosses between *P.*

trifoliata and citrange were found to permit virus increase in the same way as the sweet orange parent, while others resemble *P. trifoliata* in inhibiting multiplication of the infective principle. Back-crosses of citrange to sweet orange tend to behave like the latter parent. Hybrids between *P. trifoliata* and citrumelos generally react similarly to the *P. trifoliata* parent. Hence it would appear that tissue tolerance and inaptitude for virus increase are dependent on dominant factors in this type of cross. Hybrids between *C. reticulata* and tangelos do not show a clear-cut type of inheritance. From the plant-breeding standpoint, an inhibitory action on virus increase is a character of little value in rootstock improvement, since the scions of most commercial varieties permit the multiplication of the pathogenic agency. The object to be achieved is a combination of the tissue tolerance characteristic, e.g., of *P. trifoliata* and hybrids, sweet orange, and *C. reticulata*, with other desirable qualities, such as vigour, resistance to gummosis [*Phytophthora* spp.: ibid., **22**, p. 353; **30**, p. 34], and the like.

The results of field tests showed the reaction of infective buds on different rootstocks to vary, not only with the tolerance or non-tolerance of the rootstock tissues but also with the same properties in the buds themselves. Thus, infective buds of tolerant types like the sweet orange, budded on non-tolerant stocks, produce a first flush of apparently sound growth which after about two months, however, develops pathological symptoms. On the other hand, in the case of non-tolerant buds on non-tolerant stocks, the appearance of tristeza symptoms is practically coincident with the onset of growth. Tolerant buds on tolerant stocks do not usually develop symptoms even though the plant is a carrier of the virus. Non-tolerant, infective buds on tolerant stocks may, however, exhibit signs of tristeza. An explanation of these reactions is advanced, based on the relationship between virus movement and food translocation in the plant.

Experimental evidence is adduced to demonstrate the probability of a connexion between the tristeza virus and the phloem.

In extensive field tests all the buds taken from old sweet orange plants with long-established infections were found to harbour the virus, which was not uniformly present, on the other hand, in recently infected young plants of Duncan grapefruit, sour orange, or in some cases of Dancy tangerine and Valencia sweet orange. It is not yet known whether buds maturing prior to infection may temporarily escape virus invasion, or if the non-tolerance of the tissues in some types may to a certain extent restrict systemic penetration.

Grant (T. J.), Costa (A. S.), & Moreira (S.). **Studies of tristeza disease of Citrus in Brazil.**—*Proc. Fla hort. Soc.*, **62**, pp. 72–79, 1950.

In connexion with a discussion of the reaction of citrus rootstocks, scions, and seedlings to inoculation with the tristeza root rot virus [see preceding and next abstracts], tabulated lists are given of 84 varieties found to be non-tolerant of the disease and therefore unsatisfactory as rootstocks for sweet orange under exposure to infection, and of 69 which survived rigorous testing at Campinas, São Paulo, in a healthy condition and are accordingly rated as tolerant. The latter comprise the Jaffa, Valencia, Washington Navel, and nine other sweet orange varieties, Columbia Sweet and Sweet (PI 1158) lemons, 25 mandarins and hybrids, 16 tangelos, the large-flowered trifoliate orange (*Poncirus trifoliata* × sweet orange), six citranges, and six citrumelos.

The application of the results of the tests to current practice is discussed.

Moreira (S.), Costa (A. S.), Grant (T. J.). **Conhecimentos atuais sôbre a 'tristeza' dos Citrus.** [Information available to date on the 'tristeza' of Citrus.]—*Rev. Agric., Piracicaba*, **24**, 11–12, pp. 335–345, 1949. [Received March, 1951.]

The available information on the tristeza root rot of citrus, with special reference

to the conditions prevailing in São Paulo, Brazil [see preceding and next abstracts], is summarized under various aspects, including etiology, nature of the injury, insect vectors, reaction to the disease of different stock-scion grafts, multiplication of the virus, and studies on an extensive citrus collection at the Campinas Agronomic Institute.

Bitancourt (A. A.) & Rodrigues (A. J.). **Estudos sôbre a 'tristeza' dos Citrus. I. Analise estatística da distribuïção das árvores doentes de um pomar de Laranjeira Doce enxertada sôbre Laranjeira Azeda.** [Studies on the tristeza of Citrus. I. Statistical analysis of the distribution of diseased trees in a grove of Sweet Orange grafted on Sour Orange.]—*Arq. Inst. biol., S. Paulo*, 18, 16, pp. 313–338, 4 diags., 1 graph, 1948. [English summary.]

The incidence of 'tristeza' root rot in an orchard of sweet oranges on sour orange stocks at the São Paulo Biological Institute [see preceding and next abstracts] was recorded on 28th November, 1942, 8th October, 1943, and 3rd January, 1945, using Cochran's analysis of later counts (*J.R. statist. Soc.* (*Suppl.*), 3, pp. 49–67, 1936) and that of Zentmyer *et al.* of the effect of distance as a dosage factor on the percentage of diseased plants [*R.A.M.*, 24, p. 211].

The root rot spread from the diseased trees was mostly towards the north-east in the first count and in no predominant direction in the second. The infectivity of the diseased trees and the 'gradient of infectivity' round them were higher at the first than at the second count. The effect of distance at the first count was consistent with the hypothesis of a random distribution of pathogenic micro-organisms or their vectors. The departure from expectation of the second- and third-count data is attributed to the development of secondary foci of infection. The 'gradient of infection' in the grove, as expressed by the slope of the regression lines of the probit-logarithm graph, remained the same in the three counts.

Of the various theories as to the etiology of 'tristeza' which had been advanced at the time the authors' studies were begun, the only one in apparent agreement with the conclusions reached is that of an infectious disease with an easily spreading pathogen or vector.

Bitancourt (A. A.). **Estudos sôbre a 'tristeza' dos Citrus. II. Susceptibilidade das diversas combinações de enxertia de Laranjeira Doce e Laranjeira Azeda.** [Studies on the 'tristeza' of Citrus. II. Susceptibility of the various graft combinations of Sweet Orange and Sour Orange.]—*Arq. Inst. biol., S. Paulo*, 20, 4, pp. 39–52, 7 pl., 1951. [English summary.]

From November, 1943, to February, 1944, and again in October, 1944, various grafts, reciprocal, and 'sandwich' grafts of sweet and sour orange were made at São Paulo. The trees were planted between 18th and 29th September, 1945, and the first 'tristeza' symptoms [see preceding abstracts] were observed in some of the combinations early in 1947. At the final readings on 23rd September, 1947, the symptoms were severe in all the sweet orange trees on sour orange, but less so in crown grafts of sweet and sour on sour, and sweet on sweet roots. In all these the sour orange trunk and roots were much less developed than in sour on sour roots or in the symptomless groups. The trees with 'sandwich' grafts of sour in sweet presented the most interesting features, consisting of normally coloured leaves, a very small, ill-developed crown, and a marked constriction of the sour orange section of the trunk in comparison with the sweet sections above and below. The collapse of the phloem in the sour orange bark did not altogether prevent the translocation of carbohydrates from the sweet top to the sweet roots, suggesting the possiblity of translocation through the cell walls rather than the phloem tubes. No tristeza symptoms were observed in other groups. It is apparent from the results of this experiment that the 'tristeza' virus will multiply sufficiently for the

symptoms to become manifest only where a sour orange stock or section of stock is topped by an adequate crown of sweet foliage. It is concluded that the effect of the virus is to alter the carbohydrate metabolism in the sour orange bark by preventing the synthesis of cellulose and starch in its cells [cf. *R.A.M.*, 28, p. 61].

Costa (A. S.) & Grant (T. J.). **Studies on transmission of the tristeza virus by the vector, Aphis citricidus.** –*Phytopathology*, 41, 2, pp. 105–113, 1 fig., 1951.

In studies at Campinas, Brazil, on the part played by *Aphis citricidus* in transmitting the citrus tristeza root rot virus [see preceding and next abstracts], groups of 25 to 50 viruliferous aphids were able to transmit the virus in a minimum feeding period of 30 minutes, while one of four hours apparently suffices to ensure maximum transmission. Comparable groups of non-viruliferous aphids may become infective after one hour's feeding on a diseased plant, but infectivity increased with prolonged feeding, and the maximum transmission was obtained with aphids that had fed for 24 hours on the virus source. Infectivity was lost by the viruliferous aphids after feeding for 24 hours and upwards on healthy plant material, and they remain non-infective if kept on the same plant for five days, even if it is a host permitting multiplication of the virus. It is advisable, however, to feed the aphids on healthy sour orange plants to obtain non-viruliferous colonies from field collections. Sour oranges were more easily infected and the virus recovered by grafting than by means of viruliferous aphids.

Grant (T. J.) & Costa (A. S.). **A mild strain of the tristeza virus of Citrus.** – *Phytopathology*, 41, 2, pp. 114–122, 1 fig., 1951.

In the course of the extensive rootstock tests proceeding as a joint enterprise of the São Paulo Agronomic Institute and the United States Department of Agriculture more than 2,000 citrus rootstock-scion combinations have been inoculated with the tristeza root rot virus [see preceding abstracts]. The existence of a mild strain of the virus, characterized by its ability to cause stunting and yellowing and sometimes symptoms like those of zinc deficiency, was first demonstrated experimentally in 1948. Like the severe strain, from which it differs rather in intensity of symptoms and in the time required for their expression than in nature, the mild strain has been transmitted both by budding and the aphid vector [*Aphis citricidus*]. Initial evidence is presented of the protective action of the mild strain against subsequent invasion by the severe one, even in the case of plants repeatedly infested with viruliferous aphids.

Stepanov (K. M.). Об источниках заразного начала инфекционного усыхания Лимонов ('мальсекко'). [On the sources of the initial infection of Citrus wilt ('mal secco').]—*Rep. Lenin Acad. agric. Sci.*, 15, 8, pp. 39–44, 2 figs., 1 graph, 1950.

The pycnidial fructifications of *Deuterophoma tracheiphila* [C.M.I. map No. 155; *R.A.M.*, 30, p. 317] were studied during 1948 and 1949 in the field in Adzharia, U.S.S.R., and in the laboratory. They were found on infected citrus branches and shoots, especially on pruning wounds, on cuttings, and on broken twigs, leaves, and lemon fruits on the ground. Pycnidia did not develop on cuttings from infected trees placed on soil at room temperature (10·2° to 19° C.) and 90 and 100 per cent. air humidity unless the substrate was moistened. Green shoot cuttings from a diseased lemon tree were kept in the laboratory from October, 1948, to February, 1949, when they were placed on dry or thoroughly wetted filter paper at 100 per cent. air humidity. Numerous pycnidia developed only on the wetted. Pieces from infected branches which had failed to produce pycnidia after five months in the laboratory at a high air humidity in 1948 were removed outdoors during a rainy period in October. The first pycnidia were observed after 15 days and were

abundant after 25 days. Experimental evidence demonstrated that pycnidia were formed at temperatures ranging from 5° to 27° [cf. ibid., 27, p. 469], the optimum being 12° to 13°. Accordingly, pycnidial production is greatest in the autumn, early winter, and early spring.

Control measures include the timely destruction of infected trees and tree parts, disinfection of surface cuts, and spraying neighbouring trees with Bordeaux mixture at high concentrations.

Reuther (W.) & Smith (P. F.). **A preliminary report on the relation of nitrogen, potassium, and magnesium fertilization to yield, leaf composition, and the incidence of zinc deficiency in Oranges.**—*Proc. Amer. Soc. hort. Sci.*, 56, pp. 27–33, 1950.

A long-term factorial experiment was started in 1947 with young, bearing Valencia orange trees on acid, deep sandy soil in Florida to determine the effect of fertilizer treatments on the development of zinc deficiency [*R.A.M.*, 23, p. 482; 25, p. 559]. Towards the end of two years mild zinc deficiency symptoms became apparent. Incidence increased cumulatively as the nitrogen and potassium levels increased, but was not affected by magnesium.

Meiffren (M.). **Note préliminaire sur l'étude de la maladie des Cocotiers au Togo.** [A preliminary note on the study of the disease of Coco-nut Palms in Togoland.] —*Agron. trop.*, 6, 3–4, pp. 163–172, 9 figs., 1 diag., 1 graph, 1951.

A disease of coco-nut palms which has been present in French Togoland for some years is now estimated to affect nearly 15,000 palms over an area of about 100 ha., or 2 per cent. of the total area devoted to coco-nut cultivation. In so far as can be ascertained at present the disease is considered to be identical with the unknown disease in Jamaica [*R.A.M.*, 29, p. 559]. In 1947 preliminary studies in Togo and the Gold Coast [cf. ibid., 28, p. 162] seemed to indicate a fungus root rot aggravated by dry soil conditions. In that year an experimental plot of 156 trees was established at Kaincopé. The progression of the disease was constant and indicative of a parasite, but its intensity was irregular. The percentage of affected trees rose from 3·8 in 1947 to 46·1 in April, 1950. Sap transmission and grafting experiments were made but proved unsuccessful in transmitting the disease.

More than 50 per cent. of the tissue fragments from the trunks of infected trees grown on potato agar yielded *Fusarium oxysporum* [cf. ibid., 30, p. 317] often associated with *Thielaviopsis* [*Ceratostomella*] *paradoxa* [ibid., 24, p. 367]. Twenty per cent. of the cultures from the base of the petioles yielded *Fusarium*, while 50 per cent. yielded *C. paradoxa*.

The author stresses the need for experimentation on the introduction of organic fungicides into the trunks of affected trees and suggests the use of cryptonol [ibid., 30, p. 155]; 5 to 20 gm. of the product should be introduced into the trunk about 1 m. above the soil into holes not more than 5 cm. deep and 2 cm. wide; the treatment should be repeated every month where necessary. A general fertilizer rich in phosphorus and low in potassium is recommended.

Moreau (C.) & Moreau (Mireille). **Neocosmospora vasinfecta E. F. Smith. Faux wilt du Cotonnier.** [*Neocosmospora vasinfecta* E. F. Smith. False wilt of Cotton.]—*Rev. Mycologie, Suppl. colon.*, 15, 2, Fiche 2, 5 pp., 1 figs., 1950.

An account is given of *Neocosmospora vasinfecta* [*R.A.M.*, 17, p. 146; 18, p. 248], including its geographical distribution, host range, symptoms on cotton, morphology, biological characters, and control [cf. ibid., 15, p. 462]. Since the organism can live as a saprophyte in the soil, new plantings should not be made for several years in areas where diseased plants have been found; soil disinfection is also advised. Three varieties are known: *N. vasinfecta* var. *tracheiphila* on *Vigna*

sinensis, var. *nivea* on watermelon [ibid., 23, p. 475], and var. *sesami* on sesame [ibid., 6, p. 123].

Dodge (B. O.). **A fungus capable of parasitizing wharf-piling borers.**—*Bull. Torrey bot. Cl.*, 78, 3, pp. 201–205, 1 fig., 1951.

Some of the Dutch wharf borers (*Nacerda melanura*) responsible for extensive damage to New York wharf piling have recently been parasitized by a snow-white mould with conidia measuring 1 to 2½ μ, consisting of both chromogenic and non-chromogenic races, and tentatively identified as a species of *Beauveria*, possibly *B. effusa* [*R.A.M.*, 29, p. 619] or *B. globulifera* [ibid., 25, p. 262].

Wolf (F. T.). **The cultivation of two species of Entomophthora on synthetic media.**—*Bull. Torrey bot. Cl.*, 78, 3, pp. 211–220, 1951.

At the Department of Biology, Vanderbilt University, Nashville, Tennessee, *Entomophthora* [*Empusa*] *apiculata* [*R.A.M.*, 19, p. 201] and *Entomophthora coronata* [ibid., 21, p. 15; 27, p. 321] made satisfactory growth on a synthetic medium [cf. ibid., 26, p. 544] consisting of glucose, asparagine (optimal concentrations 2 and 0·3 per cent., respectively), and mineral salts. The only sugars utilized, besides glucose, were laevulose, galactose, mannose, and trehalose. In tests of 24 amino acids as sources of nitrogen, serine, asparagine, glycine, tyrosine, and alanine were most favourable for *Empusa apiculata*, and aspartic acid, asparagine, glycine, alanine, and serine for *Entomophthora coronata*.

Thung (T. H.), Sloof (Miss W. C.), & Reitsma (J.). **Pythium splendens as the cause of wilt on Corchorus capsularis L.**—*Contr. gen. agric. Res. Sta., Bogor* (formerly *Meded. alg. Proefst. Landb. Batavia*) 109, pp. 22–26, 1 fig., 1950. [Indonesian summary.]

The fungus isolated from the sunken, dark spot (1·5 by 0·5 cm.) on the stem base of wilted *Corchorus capsularis* plants at Bogor, Java, in 1942 was identified as a *Pythium* closely resembling *P. splendens* [*R.A.M.*, 28, p. 398], but differing from it in the occurrence of intercalary chlamydospores and in having one to four antheridia instead of three to eight to each oogonium.

Inoculation experiments on injured and uninjured leaves resulted in the development of lesions over 5 cm. in diameter after three days on the former and after five on the latter. Young plants inoculated through the stem soon wilted and died, but older ones were less susceptible, developing only small, black spots. In similar tests on injured tobacco leaves the symptoms were very mild, the maximum diameter of the spots after four days being 1 cm. The mycelium invaded the veins of wounded and intact tobacco seedlings for a distance of about 1 cm. upwards, merely blackening the adjoining tissues; in the opposite direction it spread slightly farther and caused more extensive disintegration but did not kill the plants. *C. capsularis*, tobacco, and *Amaranthus tricolor* seeds sown in sterilized soil inoculated with the *Pythium* gave rise to plants with dark, watersoaked roots and other symptoms of damping-off. Spraying with Bordeaux mixture gave satisfactory control. Unduly close spacing of the seedlings should be avoided.

McKnight (T.). **Pasmo disease of Linseed.**—*Qd agric. J.*, 72, 2, pp. 94–96, 2 figs., 1951.

Pasmo disease (*Sphaerella linorum*) [*R.A.M.*, 28, p. 628; 30, p. 21] appeared for the first time in Queensland on maturing crops of Walsh linseed flax on the Darling Downs in November, 1949, spreading rapidly in showery, humid conditions. Good conditions for the development of the fungus early in the season resulted in stem girdling near ground level and the death of the main stem; losses may vary from 5 to 50 per cent. Usually, however, in Queensland the disease is confined to the

post-flowering period, so that provided the bolls are well-developed at the time of attack the yield is not seriously reduced. Both new and existing varieties are being tested for resistance.

Berkeley (G. H.). **Gladiolus viruses.**—Abs. in *Phytopathology*, 41, 1, pp. 3–4, 1951.

Picardy and other *Gladiolus* varieties [in Canada] suffering from mosaic virus [cf. *R.A.M.*, 26, p. 275] were shown to be infected by strains of tobacco ring spot, while a single plant of Mrs. Marks Memory, displaying chlorotic ring and line-pattern symptoms, harboured a combination of the ring spot and tobacco mosaic viruses. An unknown variety, moreover, was found to be infected by a yellow strain of the cucumber mosaic virus. These viruses were transmitted by juice transfer from sprouts 1 to 2 in. long of both planted and unplanted corms, and from tips of leaves up to 12 in. long, their identity being confirmed by a comparison of symptoms on Harrow Velvet tobacco, *Nicotiana glutinosa*, Laxton's Progress peas, Michelite and Bountiful beans [*Phaseolus vulgaris*], snapdragon [*Antirrhinum majus*], Bonny Best tomato, Windermoor Wonder cucumber, California Wonder [chilli] pepper, and *Datura stramonium*, and by cross-protection tests in the case of tobacco ring spot. The cucumber mosaic and tobacco mosaic viruses induced the typical symptoms associated with them, except that *D. stramonium* was killed by the *Gladiolus* strain of tobacco mosaic.

Seeley (J. G.). **Mineral nutrient deficiencies and leaf burn of Croft Easter Lilies.**—*Proc. Amer. Soc. hort. Sci.*, 56, pp. 439–445, 2 figs., 1950.

During recent years a foliar spotting or burning has been observed on Croft Easter lily [*Lilium longiflorum*] plants in many commercial greenhouses in the United States. The necrotic areas occur as a dying-back of the leaf tips or as semi-circular areas along the edge of the leaves. When Croft lilies were grown in nutrient sand cultures with and without various elements foliar burn and spotting developed in all treatments. Incidence was least in minus nitrogen, minus phosphorus, and distilled water. Bud-blasting developed in calcium deficient plants.

In the author's opinion, the fertilizer conditions in which the bulbs are produced in the field may possibly influence the response of lilies to nutrient deficiency treatments and the occurrence of leaf burn in subsequent forcing. Lily bulbs from different sources may then react differently to the same nutrient treatment.

Beaumont (A.). **Campanula diseases.**—*Gdnrs' Chron.*, Ser. 3, 129, 3358, p. 157, 1951.

Wilt due to *Verticillium albo-atrum* has been found on *Campanula isophylla*, but the only soil fungus causing appreciable damage to *Campanula* [in England] is *Sclerotinia sclerotiorum* [*R.A.M.*, 4, p. 417; 6, p. 555], which is widely distributed on Canterbury bells [*Campanula medium*] and has also been reported on *C. pyramidalis* and *C. persicifolia*. Leaf spot due to *Ramularia macrospora* [cf. ibid., 22, p. 10] has occurred in several places in southern England; the brown spots are distinguishable from those of *Ascochyta bohemica* [ibid., 27, p. 79] by being larger and more irregular and not having a purple margin or pycnidia. The only British rust attacking *Campanula* (including *C. planiflora* var. *alba*) is *Coleosporium campanulae* [ibid., 19, p. 133; 25, p. 18], and the only virus recorded on the host in England is the tomato spotted wilt virus, from Somerset [ibid., 13, p. 133], Yorkshire, and Devon.

Beaumont (A.). **Sweet Pea diseases.**—*Gdnrs' Chron.*, Ser. 3, 129, 3355, p. 132, 1951.

In England root rots of sweet pea are caused by *Aphanomyces euteiches* [cf. *R.A.M.*, 15, p. 767], *Fusarium culmorum* and *F.* spp., and *Thielaviopsis basicola*. Damping-off caused by *Pythium* [cf. ibid., 14, p. 151] is uncommon and root rots caused by *Ascochyta lathyri* [cf. ibid., 22, p. 154] and *Mycosphaerella pinodes*

[ibid., 11, p. 423] are very rare. The commonest disease is mildew (*Erysiphe polygoni*) [cf. ibid., 6, p. 511; 13, p. 215], which is prevalent at the end of summer. Downy mildew (*Peronospora viciae*) [cf. ibid., 26, p. 1] is troublesome locally in some seasons. White mould (*Ramularia deusta*) [ibid., 3, p. 652; 30, p. 41] is widely distributed and sometimes severe.

The only bacterial disease of sweet pea recorded in England is leafy gall (*Corynebacterium fascians*) [ibid., 28, p. 274]. Virus diseases include common mosaic [ibid., 18, p. 784], enation mosaic [loc. cit.], and streak, which may be caused by several viruses [ibid., 19, p. 561]. Lettuce mosaic [ibid., 18, p. 784; 19, p. 561] and tomato spotted wilt [loc cit.] are also found on sweet peas; streak due to cucumber virus 1 [cucumber mosaic virus: loc. cit.] is rapidly fatal.

Caldwell (J.). **Further observations on Chrysanthemum virus disease.**—*Gdnrs' Chron.*, Ser. 3, 129, 3356, p. 141, 1951.

A few years ago a disease of chrysanthemums caused by the aspermy virus of tomato [*R.A.M.*, 29, p. 180] was observed to be very widespread on chrysanthemums in the south-west and other parts of England. The virus spread rapidly from chrysanthemums to outdoor tomato plants growing in mixed market gardens. Great care should be taken in eliminating diseased chrysanthemum plants from propagating material.

James (M. O.) & Plakidas (A. G.). **Foot rot of Chinese Hibiscus.**—Abs. in *Phytopathology*, 41, 1, p. 19, 1951.

The fungus responsible for a fatal disease of *Hibiscus rosa-sinensis* in Louisiana has been tentatively identified as *Phytophthora cactorum* var. *applanata* [*R.A.M.*, 11, p. 580]. The symptoms comprise decay of the crown and main roots, gradual wilting and yellowing of the foliage, and discoloration of the stem. Foot rot occurs naturally on the Kona, Brillantissima, Venus, Hawaiian Fountain, Agnes Gault, Lambert, Pink Beauty, Jigora, Dolores, Euterpe, and Peachblow varieties, and was artificially induced in several by the inoculation of well- or ill-drained, steam-sterilized soil in the lath house with pure cultures of the fungus.

Dimond (A. E.) & Chapman (R. A.). **The chemotherapeutic properties of two compounds against Fusarium wilts.**—Abs. in *Phytopathology*, 41, 1, p. 11, 1951.

In greenhouse tests [at the Connecticut Agricultural Experiment Station] incipient infections by *Fusarium dianthi* on carnation [*R.A.M.*, 29, pp. 576, 606] and *F.* [*bulbigenum* var.] *lycopersici* on tomato have been effectively eliminated by the application to the soil of aqueous solutions of 4-chloro-3-5-dimethylphenoxyethanol (code No. 1182) and 2-norcampane methanol (code No. 1207), which were absorbed through the roots. Treated plants inoculated with *F. b.* var. *lycopersici* invariably ranked low in disease grade, which was linearly related to the logarithm of the dosage applied for each compound, whereas the controls were severely infected. To be effective the treatments must be made serially in advance of infection. Their therapeutic action is transient. In the case of *F. b.* var. *lycopersici* the two compounds, of which No. 1182 has given more consistent protection than No. 1207, are more inhibitory to mycelial growth than to sporulation. No 1182 exerts a formative effect on tomatoes and the characteristic odour of No. 1207 is imparted to the foliage of plants absorbing it. These properties can be used to trace the distribution and duration of activity in the plants.

Murakishi (H.) & Hendrix (J. W.). **The effect of growth substances and fungicides on the rooting and survival of Carnation cuttings grown in naturally infested soil.**—*Proc. Amer. Soc. hort. Sci.*, 56, pp. 485–490, 3 figs., 1950.

When attempts are made to propagate carnations in certain local soils in Hawaii,

complete losses due to poor rooting are not uncommon. Much of the failure is traceable to root rot (associated with *Fusarium dianthi*, *Rhizoctonia* [*Corticium*] *solani*, *Alternaria dianthi*, and *Colletotrichum* sp.) [cf. *R.A.M.*, 25, p. 344; 28, pp. 334, 396; and preceding and next abstracts] caused by wilt-infested soil following intensive cultivation of carnations in the Koko Head area on Oahu. In three attempts to improve the establishment of cuttings in infested soil, treatment before planting with fungicides alone and growth substances alone gave little consistent benefit, but in combination with assorted growth substances fermate and zerlate appeared outstanding among the fungicides, while indolebutyric and indoleacetic acid were excellent when used in combination with assorted fungicides. Fermate plus indolebutyric acid was the most promising single combination.

In the field many rooted plants succumbed to root rot and wilt shortly after transplanting. Although roots of one-month-old cuttings did not always show the presence of root rot, root invasion must have occurred, as in later tests a high rate of mortality was noted among plants left in the cutting bench. This is explained by assuming loss of protective power of the fungicide in the soil. These results suggest that soil treatment by fumigation or drenching may be necessary as an adjunct to slip treatment [see next abstract]. Further work is in progress.

Hendrix (J. W.) & Murakishi (H.). **Influence of some soil treatments on the rooting and survival of Carnation slips in Hawaii.**—*Proc. Amer. Soc. hort. Sci.*, 56, pp. 491–497, 4 figs., 1950.

In three tests made to determine the efficacy of certain soil fumigants and amendments in controlling post-rooting mortality of 'pink' carnations in soil naturally infected with *Fusarium dianthi*, *Alternaria dianthi*, *Rhizoctonia* [*Corticium*] *solani*, *Sclerotium rolfsii*, *Phytophthora* sp., and *Colletotrichum* sp. in the Koko Head area, Hawaii [see preceding abstract], it was found that the initial rooting of cuttings in any one test was approximately the same irrespective of treatment. Rooting percentages decreased, however, with advancing season, being 97·8 per cent. in April, 88·4 per cent. in May, and 50·1 per cent. in July. In untreated soil the percentage mortality of rooted plants was 33·9, 36·8, and 80·2 per cent. for the three tests, respectively. The two most promising soil treatments were chloropicrin at 600 lb. per acre, the corresponding figures being 0·5, 2·3, and 15·6 per cent., and formaldehyde ($\frac{1}{2}$ gal. 1 in 50 solution per sq. ft.) 4, 8·4, and 6·2 per cent.

It is believed that the use of chloropicrin or formaldehyde in cutting beds might help Hawaiian growers to procure greater numbers of rooted cuttings, but other control measures must be developed before growers can expect to lengthen appreciably the life of the field phase of the crop.

Schultz (H.). **Untersuchungen über die Rolle von Pythium-Arten als Erreger der Fusskrankheit der Lupine. II. Ergebnisse von Infektionsversuchen.** [Studies on the role of *Pythium* species as agents of Lupin foot rot. II. Results of inoculation experiments.]—*Phytopath. Z.*, 17, 2, pp. 200–214, 9 figs., 2 graphs, 1950.

A full account is given of experiments performed between 1939 and 1943 at the Schwiebus branch of the Biological Institute, Berlin-Dahlem, to determine the pathogenicity of *Pythium* species to lupins (in connexion with foot rot) [*R.A.M.*, 19, p. 282; 25, p. 346] and other hosts. The reactions of the test plants to inoculation (in some cases with over 100 isolates) was expressed by a scale of values ranging from 1 to 5, in which 1 to 1·4 represents no infection, 1·5 to 2·9 slight, 3 to 4·4 severe, and 4·5 to 5 very severe. Some of the tests were carried out in soil as well as in water cultures.

P. debaryanum caused severe to very severe infection of most of the large-seeded species tested. The mean values (1938 to 1941) for blue (*Lupinus angustifolius*), white (*L. albus*), and yellow (*L. luteus*) lupins in water were 4·4, 3·8, and 2·6 respectively, in sand 4·6, 4·3, and 3·8, and in compost 4·5, 4, and 4. Victoria peas gave a mean value of 4·6 (or 4·8 for 23 exceptionally pathogenic strains), soy-beans 4·5, and two varieties of beans (*Phaseolus vulgaris*) 4·4 and 4·8 with a few strains only, but these data require substantiation. Field peas, broad beans, vetch, and *Vicia villosa* were much more resistant (2·2, 1·8, 1·2, and 1, respectively). Other mean values were: lucerne 4·8, *Medicago lupulina* 4·1, red, white, alsike, and crimson clovers 3·1, 3·3, 3·6, and 5, respectively, *Lotus corniculatus* 3·3, *Melilotus albus* 4, *Ornithopus sativus* 3·5, *Anthyllis vulneraria* 5, and *Onobrychis sativa* [*O. viciifolia*] 4·6. Cucumber, cauliflower, *Matthiola incana*, beet, and tobacco gave mean infection levels of 4·6, 4·8, 4·7, 4·7, and 4·6, respectively, spinach 4·2, sunflower 3·2, and barley 1·1.

Pythium irregulare was generally less virulent than *P. debaryanum*, causing infection of blue, white, and yellow lupins in water cultures represented by values of 4·8, 3·7, and 4·3, the corresponding figures in soil being 3·7, 2·7, and 2·5, respectively. In small-scale tests on Victoria peas, soy-beans, and broad beans the values were 2·9, 3·3, and 2·1, respectively. For lucerne, crimson clover, and *Ornithopus sativus* the mean infection levels were 4·3, 3·8, and 3·7, and for cucumber, cauliflower, *M. incana*, beet, spinach, and tobacco 3·7, 3·5, 5, 4·4, 4·2, and 3·7, respectively; barley was not attacked.

The degree of infection induced by *P. intermedium* was almost uniformly slight, blue lupins being the exceptions with 3·1 in water and 3·4 in soil cultures. The corresponding values for white lupins in water and soil were 2·2 and 1·5 and for yellow 2·8 and 1·5, respectively. The remaining plants were rated as follows (in soil): peas 1·7, broad beans 1·4, lucerne 2·8, crimson clover 2·5, red and alsike clover 1·1, *L. corniculatus* 1·3, *O. sativus* 2·6, cucumber 3·7, cauliflower 2·4, beet 3·7, spinach 3, and tobacco 2.

The ratings assigned to blue lupins inoculated with *P. salpingophorum* [ibid., 10, p. 211] in water and soil were 4·4 and 3·3 and to white 2·5 and 1·7, respectively; (in soil) to yellow lupins 1·6, peas 1·9 and broad beans 1. Lucerne and crimson clover suffered relatively heavy damage (3·5 and 2·9, respectively), while *L. corniculatus* and *O. sativus* were only slightly infected (2·2 and 1·6), red clover remained healthy (1·1), and the non-leguminous plants, except beet (4·1), were highly resistant.

P. artotrogus caused infection levels on blue, white, and yellow lupins (in water) of 2·2, 2·5, and 2, respectively. The one isolate used in a soil culture was innocuous to all the test plants.

P. mamillatum was not generally injurious, only lucerne and cauliflower being very severely and cucumber severely attacked.

The single culture available of *P. ultimum* was equally pathogenic with *P. debaryanum* to all the test plants.

Hagedorn (D. J.) & Hanson (E. W.). **The relationship between Wisconsin Pea stunt and Red-Clover vein mosaic.**—Abs. in *Phytopathology*, 41, 1, p. 15, 1951.

The strikingly similar symptoms of Wisconsin pea stunt [*R.A.M.*, 29, p. 132] and red clover vein mosaic [ibid., 17, p. 249; 19, p. 230] led to a comparative study of the responsible viruses. Their essential identity in respect of symptomatology, temperature relations, host range within 15 species from three families, reactions of ten pea varieties, and physical properties was established. It is concluded, therefore, that one and the same virus is concerned in the etiology of the two diseases, both of which are widespread, and often closely associated, in Wisconsin.

Sprague (R). **Diseases of cereals and grasses in North America.**—xvi+538 pp., 81 figs., New York, The Ronald Press Company, 1950. $7.00.

This useful treatise, intended to aid workers in the identification of fungi (excluding smuts and rusts) parasitic on cereals and grasses [*R.A.M.*, 29, p. 101; 30, pp. 80, 324] in North and Central America and Hawaii, includes technical descriptions, host range by States or provinces, world distribution, and citations to important literature for some 34 Phycomycetes (including one new species and 18 species of *Pythium*), 88 Ascomycetes (7 of *Claviceps* and 34 of *Phyllachora*), and 15 Basidiomycetes.

Synchytrium graminicola n.sp. is relatively common as the cause of purple leaf speckle on living leaves of many grasses in wet pastures, meadows, open woods, and lawns in western Oregon and Washington during winter. The spots are small with straw-coloured to light brown or yellow-grey centres. The diffuse edges become purple to amethyst. The sori are subepidermal, erumpent, and globose, causing very slight gall formation, operculate to definitely ostiolate, hyaline, and solitary or sometimes gregarious or a few closely packed. The sori were always empty when found; the sorus wall is firm, evident, and hyaline.

Some new combinations are made, including *Placostroma bambusae* for *Melanconium bambusae* [ibid., 26, p. 219] on bamboo, *Ramulispora bromi* for *Centrospora bromi* [ibid., 26, p. 133] on *Bromus rigidus* and *B. vulgaris*, and *Spermospora avenae* for *Pseudodiscosia avenae* [ibid., 22, p. 299] on *Arrhenatherum elatius*, *Avena byzantina*, and oats.

The major part of the book (pp. 147–436) is devoted to about 247 species and subcategories of Fungi Imperfecti, of which *Septoria* and *Helminthosporium* are dealt with most exhaustively. Keys are provided for the identification of the genera and of the species of some of the genera; a glossary of technical terms used, host index, and a comprehensive 79-page bibliography are appended.

Langdon (R. F. N.). **A new ergot from Queensland.**—*Proc. roy. Soc. Qd*, 61, 4, pp. 31–35, 1950.

The germination of the sclerotia of a *Claviceps* collected on *Hyparrhenia filipendula* in South Queensland in 1948 permitted the determination of the fungus, originally observed in 1941 [*R.A.M.*, 22, p. 437], as a new species, *C. inconspicua*.

Pettinga (J. J.). **De honingzwam (Armillaria mellea (Vahl) Sacc.).** [The honey fungus (*Armillaria mellea* '(Vahl) Sacc.').]—*Fruitteelt*, 40, 46, p. 886, 1 fig., 1950.

Armillaria mellea is stated to be responsible for considerable damage in Dutch orchards [*R.A.M.*, 27, p. 244], especially on densely planted sites where the subsoil is permanently moist. The Ster apple is particularly susceptible, while other varieties affected include Beauty of Boskoop, Lemoen, Yellow Transparent, and Brabant Bellefleur, besides several kinds of pear.

Indirect control measures comprise the drastic clearance of all sources of infection and the isolation of diseased areas by means of trenches; in addition one or more applications should be made to the roots, already dried in the spring by exposure, and to a distance of 1 m. up the trunk, of a disinfectant, e.g., 0·1 per cent. mercuric chloride, which is very effective. In the following autumn the roots are covered with a mixture of soil and lime.

Houtman te Hoorn (G.). **'Witvlekkigheid' van het Pereblad.** ['White spotting' of the Pear leaf.]—*Fruitteelt*, 40, 42, pp. 806–807, 3 figs., 1950.

In connexion with an outbreak of leaf fleck (*Mycosphaerella sentina*) of pears [see next abstract] in two orchards at Wijdenes, Holland, the writer briefly describes

the life-history and symptomatology of the pathogen. In one orchard the President Loutreuil variety suffered appreciable injury, both leaves and fruits being affected, while in the other the foliage of Bonne Louise, Provisiepeer, St. Remy, Marguérite Marillat, and Legipont, especially of the two first-named, was severely damaged.

Pre- and post-blossom anti-scab [*Venturia pirina*] treatments with Bordeaux mixture and sulphur, respectively, failed to control *M. sentina* on the two most susceptible varieties but practically eliminated it on Doyenné du Comice, Conference, and Wijnpeer.

Müller (E.). **Die Weissfleckenkrankheit der Birnbäume.** [The white spot disease of Pear trees.] –*Schweiz. Z. Obst.- u. Weinb.*, 60, 8, pp. 163–166, 1 fig., 1 graph, 1951.

A brief account is given of the life-history of *Mycosphaerella sentina*, the agent of leaf fleck of pear [*R.A.M.*, 27, p. 425; 29, pp. 141, 174; 30, p. 328, and preceding abstract], the occurrence of which in Switzerland [ibid., 14, p. 590] is often overlooked owing to its late development, no conspicuous symptoms appearing before midsummer.

In studies on the temperature relations of the pathogen, the optimum for the ascospores was found to be about 21° C., permitting 90 per cent. germination. The conidia are much less exacting in this respect, over 75 per cent. germinating throughout the range from 9° to 27°.

Both spore types are much more sensitive than those of scab [*Venturia pirina*] to copper sprays, Osterwalder having obtained satisfactory control of the relatively innocuous fleck with two applications of 1·5 to 2 per cent. Bordeaux mixture [ibid., 2, p. 275] and also with lime-sulphur.

Gilmer (R. M.). **Etiology and host range of X-disease of Chokecherry.**—Abs. in *Phytopathology*, 40, 1, p. 14, 1951.

In studies on certain Wisconsin strains of the [peach] X-disease virus [*R.A.M.*, 30, p. 277], the infective principle was recovered from both roots and aerial organs of dormant infected chokecherry [*Prunus virginiana*], provided sufficient time had elapsed from the date of inoculation to permit its relatively slow passage throughout the host. Not all the branches of large, eight-year-old trees had developed symptoms even as long as 23 months after inoculation. Eleven months after inoculation the virus was not recovered from symptomless branches at a minimum distance 12 to 18 in. from those showing signs of the disease. At least four strains of the X-disease virus were differentiated on the basis of symptomatology, virulence, and ease of transmission. New hosts of the virus include the Italian Prune plum variety, *P. pennsylvanica* (both symptomless carriers), *P. maackii*, *P. padus*, *P. glandulosa*, *P. pumila*, *P. dunbarii*, *P. maritima*, and *P. tomentosa*. *P. serotina* appears to be immune.

Zubriski (J. C.) & Swingle (C. F.). **Potassium content of Montmorency Cherry leaves in relation to curl-leaf and to exchangeable soil potassium.**—*Proc. Amer. Soc. hort. Sci.*, 56, pp. 34–39, 1 graph, 1950.

In many sour cherry orchards in north-eastern Wisconsin the trees are affected by leaf curl (a condition resembling in its severe stages marginal scorch of apple leaves and rolling of peach leaves and in mild cases drought injury). The potassium content of leaves and the amount of exchangeable potassium in the soil were below 0·75 per cent. and 200 lb. per acre, respectively. It was found that a level of 0·8 per cent. in the leaves is necessary to eliminate leaf curl. Application of a mulch under the trees facilitated correction of the condition.

Braun (A. J.). **Verticillium wilt now recognized as a destructive disease of Strawberries in New York State.**—Abs. in *Phytopathology*, 41, 1, p. 4, 1951.

A species of *Verticillium* has been consistently isolated from the crowns, petioles, and flower stalks of strawberry plants with a characteristic combination of discoloration, stunting, wilting, and dying, which has occurred periodically in serious proportions for a number of years in New York State. First reported in 1932 as a major strawberry disease in California [*R.A.M.*, 29, p. 571], the wilt has not hitherto been observed to affect production in the north-east, where the symptoms generally agree with those described [as due to *V. albo-atrum*] from California. In New York, however, invariable features of the disease are moderate to severe root and crown decay and slight to moderate vascular discoloration, especially at the base of the crown. Commercial varieties in the north-east show a marked range of variation in susceptibility to *Verticillium* wilt.

Butler (E. E.) & King (T. H.). **Fungus parasitism by Rhizoctonia.**—Abs. in *Phytopathology*, 41, 1, p. 5, 1951.

Isolates of *Rhizoctonia* pathogenic to strawberry roots [*R.A.M.*, 27, pp. 430, 572] may also parasitize the mycelium of *Rhizopus nigricans* [*R. stolonifer*: ibid., 28, p. 130] (plus and minus strains), *Syncephalastrum* sp., *Mucor mucedo*, *Cunninghamella* sp., *Helicostylum* sp., and *Phytophthora cinnamomi* [ibid., 17, p. 402]. Two methods of attack were observed: (1) the *Rhizoctonia* penetrated the host mycelium by a few infection hyphae which produced internal growth of varying extent; or (2) the hyphae coiled round the mycelium and penetrated it at frequent intervals, with many infection hyphae establishing a widespread internal parasitic mycelium. The protoplasm of the host mycelium was replaced by invading hyphae, but total destruction was rare. Initial infection of hosts on potato dextrose agar occurred in three to five days at 25° C. The *Rhizoctonia* produced more abundant barrel-shaped cells and sclerotia when parasitizing other fungi than in pure culture on agar media.

Tomlinson (W. E.), Marucci (P.), & Doehlert (C. A.). **Leafhopper transmission of Blueberry stunt disease.**—*J. econ. Ent.*, 43, 5, pp. 658–662, 2 figs., 1950.

Blueberry stunt virus disease has become a serious threat to the cultivation of *Vaccinium australe* in New Jersey [*R.A.M.*, 21, p. 496]. Regular sweeping and trapping in blueberry fields revealed a large and varied leafhopper population, and transmission tests with a number of species were initiated in 1943 and have been carried on continuously since that time. In 1946 transmission was accomplished in a few cases with colonies of the most prevalent species, *Scaphytopius magdalensis* and *S. verecundus*. Further tests were performed during 1947 and 1948 and by late September, 1949, 14 of the 143 plants exposed to the *S. magdalensis–S. verecundus* complex had become diseased, while 417 controls and 374 plants tested with other insects during the same period remained healthy.

The two vectors of blueberry stunt, like their various hosts among the Ericaceae, commonly occur in low, moist situations. In New Jersey the first adult population peak is reached in late June and early July and the second in late September and early October. Where initial stunt infection is slight and there are no unrogued cultivated blueberries in the vicinity, roguing alone is sufficient. In cases of heavy infestation, however, vector control is essential. In experiments in 1948 and 1949, using 2 lb. 50 per cent. DDT or methoxychlor per 100 gals., 95 per cent. reduction of the leafhoppers was achieved in two-acre plots of mature plants.

Bensaude (Mathilde) & Jenkins (Anna E.). **An obscure disease of Banana.**—Abs. in *Phytopathology*, 41, 1, p. 3, 1951.

An apparently new disease of banana reported from St. Michael Island, Azores, in

1927 [*R.A.M.*, 6, p. 465], and also believed to be present in Madeira, has since been found to simulate infection by a *Sphaceloma* in its symptomatology and association with humid conditions. This hypothesis was corroborated in 1949–50 by field observations and laboratory studies, which demonstrated the occurrence of the disease in the form of minute, watersoaked spots on young fruits 5 to 7 cm. long with the floral parts still attached. On somewhat larger fruits there was a diminutive, corky centre in each spot. Although the exact nature of the disease is still obscure, these recent observations suggest the intervention of a pathogen producing copious inoculum.

Anderson (E. J.). **The Phytophthora cinnamomi problem in Pineapple fields of Hawaii.**—Abs. in *Phytopathology*, 41, 1, pp. 1–2, 1951.

In the pineapple lands of Hawaii with an annual rainfall exceeding 50 to 60 in. *Phytophthora cinnamomi* [*R.A.M.*, 30, p. 378] may entirely destroy extensive plantings and seriously reduce yields. Roots, growing points of stems, and green fruits are liable to attack. Stem tip infection, known as heart rot, is invariably accompanied by root rot, the most injurious phase of the disease. The pathogen persists in comparatively dry soil in a more or less quiescent form and assumes a virulent character during periods of protracted wet weather, especially when the soils remain nearly or wholly saturated for several weeks. Gentle slopes and level areas with very compact subsoils sustain the heaviest damage. *P. cinnamomi* has been recovered from both the surface inch and the deeper soil layers after prolonged wet weather, but only from the latter after continuous drought. In a very compact subsoil it was isolated at a depth of 27 in.

Chapman (R. A.). **Relation of specific chemotherapeutants to the infection court.**—Abs. in *Phytopathology*, 41, 1, pp. 6–7, 1951.

For the direct inhibition of pathogenic activity chemotherapeutants applied to plants before inoculation should be located near the infection court. They tend to concentrate in the top if mobile or in the roots if substantive. Tests for inhibition zones round paper disks indicate that 8-hydroxyquinoline benzoate [*R.A.M.*, 30, p. 372] is not adsorbed by cellulose substances and moves through the plant to the top. In practice, therefore, it is more effective against the elm twig-invading *Ceratostomella ulmi* [ibid., 30, p. 350] than against *Fusarium* [*bulbigenum* var.] *lycopersici*, which enters tomato plants through the roots. On the other hand, n-octadecyltrimethylammonium pentachlorophenate is fixed by filter paper and must be similarly retained by cellulose materials in the plant roots. Hence it is toxic to *F. b.* var. *lycopersici* but not to *C. ulmi*. Since the bromide and chloride of n-octadecyltrimethylammonium do not inhibit *F. b.* var. *lycopersici*, the toxicity of the pentachlorophenate to this organism is probably a function of the pentachlorophenoxy anion. Commercial sodium pentachlorophenate is not adsorbed in inhibition zone tests, so that the n-octadecyltrimethylammonium cation is responsible for the adsorption of this compound. N-(4-nitrophenyl) -3, 4-dichlorobenzenesulphonamide controls *F. b.* var. *lycopersici* but not *C. ulmi*, behaving in inhibition zone tests exactly like n-octadecyltrimethylammonium pentachlorophenate.

Kaserer (H.). **Die Wirkungsweise der Keimlingsdüngung mit 'Porro'. Eine grundsätzliche Erörterung.** [The mode of action of seedling-fertilizing with 'porro'. A discussion of the underlying principles.]—*Bodenkult., Wien*, 4, 1, pp. 70–77, 1950.

The author claims that seed treated with the seedling-fertilizer 'porro' (Austrian patent No. 163647), a very inexpensive, non-toxic dust consisting of calcium sulphate, calcium phosphate, and soluble compounds of potassium, magnesium,

iron, manganese, titanium, and vanadium, with siliceous earth as a carrier, germinates almost as well as untreated of high germinative capacity, significantly better than untreated immature or old, but less well than untreated diseased seed. The reason for the last-named result is attributed to the stimulation of the moulds present in the seed in such a way that the equilibrium commonly existing between host and pathogen is disturbed, the latter gaining the upper hand and killing the former.

MACHACEK (J. E.). **An agar-sheet method of testing the efficiency of seed treating machines.**—*Canad. J. Res.*, Sect. C, 28, 6, pp. 739–744, 3 pl., 1950.

The author has devised a simple, rapid, and inexpensive laboratory technique for determining the uniformity with which a fungicide used as a seed treatment is deposited on the seed, the comparative potency of different fungicides, and the rate at which they are lost from the seed, a modification of the method used by Mead [*R.A.M.*, 24, p. 360]. Acidified potato sucrose agar (500 ml.) is poured to an exactly uniform depth into trays consisting of glass panes 16 by 24 by $\frac{1}{8}$ in. edged with $\frac{1}{2}$ in. glass strips. When solid the surface is dusted heavily with spores of *Penicillium purpurogenum*. Treated seeds are then placed on the agar at 2-in. intervals, and pressed in with a glass sheet which is then used as a cover, raised on glass strips to permit ventilation. The whole is incubated for two days at a room temperature of 20° to 24° C.

Two dusts, one slurry, and a fluid with an oil base, designated A, B, C, and D, respectively, were tested on wheat seed by the above method. The mean variabilities in diameter of the inhibition zones were determined as 6·11, 7·33, 9·08, and 26·69, respectively, indicating that the first three became dispersed fairly uniformly on the treated seed, but D did not disperse very well. The potency of fungicides A and C appeared to be greater than that of fungicides B and D, the diameters of the inhibition zones measuring, on an average, 2·375, 2·82, 1·227, and 1·457 cm., respectively.

MOREAU (C.). **Les maladies parasitaires des principales cultures coloniales. Revue bibliographique. VI.** [The parasitic diseases of the principal colonial crops. Bibliographical review. VI.]—*Rev. Mycologie, Suppl. colon.*, 15, 2, pp. 112–127, 1950.

Further notes [cf. *R.A.M.*, 30, p. 179] are given on the information in the literature (106 titles) published from 1948 to 1950 on the principal diseases of colonial crops.

GUIDA (V. O.) & DO AMARAL (J. F.). **Técnica de conservação de fungos em areia estéril.** [Technique of conservation of fungi in sterile sand.]—*Arq. Inst. biol., S. Paulo*, 19, 13, pp. 203–206, 1949–50. [English summary.]

In 1944 *Aspergillus flavus*, and in 1945 *A. luteus* and *A. niger*, were cultured on potato agar or Sabouraud's agar at 30° C., and when fully developed were mixed with sterile sand and transferred to sterile tubes at room temperature. In 1949 the growth of all three species on tryptonated broth was perfectly normal in respect of both morphological and physiological characters.

MILLER (D. D.) & GOLDING (N. S.). **The gas requirements of molds. V. The minimum oxygen requirements for normal growth and for germination of six mold cultures.**—*J. Dairy Sci.*, 32, 2, pp. 101–110, 3 figs., 1 diag., 1 graph, 1949.

In continuation of previous studies at the State College of Washington [*R.A.M.*, 25, p. 132], the inhibiting effect of reduced oxygen on malt agar cultures of *Oospora lactis*, *Penicillium roqueforti*, *Aspergillus flavus*, *A. niger*, *P. expansum*, and *P.*

notatum was found to be in proportion to its solubility and not directly to the composition of the gas above the medium or mycelium. Pressures between 0·5 and 2 atmospheres in air did not affect the oxygen requirements of the cultures under observation. No inhibitory effect on any culture occurred until the dissolved oxygen in the medium was below 0·8 volumes of oxygen per 1,000 volumes of water at N.T.P.

Total arrest of germination of any culture for seven days was not obtained until the dissolved oxygen content was below 0·08 volumes. In fact, *O. lactis*, which required the least oxygen of all the species used in the tests, made appreciable growth in the absence of a measurable quantity of the gas. *P. roqueforti* required the most oxygen, its growth being significantly inhibited at approximately 0·78 volumes and no germination recorded in seven days at 0·08. The corresponding figures for the other species were as follows: *A. flavus*, inhibition at 0·38 volumes, no germination in seven days at 0; *A. niger* 0·56 and 0·01; *P. expansum* 0·56 and 0·04; and *P. notatum* 0·8 and 0·06, respectively.

The optimum temperatures for growth of the six species were as follows: *O. lactis* 85° F., *P. roqueforti* 77°, *A. flavus* 90°, *A. niger* 93°, *P. expansum* 76°, and *P. notatum* 75°.

Wallen (V. R.) & Skolko (A. J.). **Antibiotic XG as a seed treatment for the control of leaf and pod spot of Peas caused by Ascochyta pisi.**—*Canad. J. Res.*, Sect. C, 28, 6, pp. 623–636, 1950.

An *in vitro* study was made at the Central Laboratory, Ottawa, of the fungistatic properties of antibiotic XG [*R.A.M.*, 30, p. 281], with a view to its possible application as a pea seed treatment for the control of leaf and pod spot caused by *Ascochyta pisi* [ibid., 29, pp. 451, 496; 30, p. 16]. No fungistatic effect on the growth of *A. pisi* on pea agar was observed at concentrations of the antibiotic up to 1 p.p.m. at pH 3·5 to 6·5 and 24° C., but above 1 p.p.m. complete inhibition occurred at all pH values tested. Temperatures ranging from 22° to 30° had no apparent effect on the action of XG. A suspension of 10,000 spores per ml. required an exposure of 12 hours to a concentration of between 50 and 100 p.p.m. XG. for a complete lethal effect. In laboratory tests samples of Lincoln peas internally infected with *A. pisi* to an extent of 14 to 15·5 per cent. were soaked in the antibiotic. Concentrations of 25 p.p.m. for 18 hours reduced infection to 0 per cent. in one sample and 4·5 per cent. in another without seriously impairing subsequent germination on agar. Higher concentrations gave better control but reduced germination. Soil germination, however, was not impaired by soaking in 50 p.p.m. and control was complete. The antibiotic was compatible with spergon applied after the seed had been soaked in XG and air-dried. In laboratory plate tests storage for three months of seed treated with XG did not affect the degree of control but reduced the germinative capacity from 66 to 53 per cent.

Landerkin (G. B.), Smith (Jane R. G.), & Lochhead (A. G.). **A study of the antibiotic activity of actinomycetes from soils of northern Canada.**—*Canad. J. Res.*, Sect. C, 28, 6, pp. 690–698, 1 pl., 2 graphs, 1950.

In tests at the Department of Agriculture, Ottawa, of 660 cultures of actinomycetes isolated on a non-selective basis from soils from five locations in northern Canada during 1949 [*R.A.M.*, 28, p. 328; 29, p. 583], 404 strains (61·2 per cent.) were antagonistic to at least one of the eight test organisms, which included *Helminthosporium sativum*, *Fusarium culmorum*, and *F. lini* [ibid., 29, p. 298], although none inhibited more than six of them. As was expected, greater antagonism was shown both in numbers and in degree against Gram-positive than against the Gram-negative bacteria. In all, 49 different antibiotic spectra were obtained, 19 of

which were represented by a single actinomycete strain. Isolates active against at least one of the pathogenic fungi mentioned above numbered 138 (20·9 per cent.); 44 were active against all three. The percentage of active cultures was greater and the degree of inhibition much more marked against *H. sativum* than against either *F. lini* or *F. culmorum*. The percentage of active isolates varied with the location and with soil depth. It is suggested that the high proportion of actinomycetes with antagonistic properties occurring in northern soils may be related to the sparser plant development in these regions.

Pehrson (S. [O.]). **Slemproblem vid ett tidningspappersbruk.** [The slime problem in newsprint plant.]—*Svensk PappTidn.*, 21, pp. 497-509, 1947. [German and English summaries. Received April, 1951.]

Microbiological analyses of slime spots and lumps from the machines in a Swedish combined mechanical pulp and newsprint mill revealed fungal spores as the principal components. Fungi predominated even on the dung-extract peptone agar medium used for the culture of bacteria and at growth temperatures unfavourable for fungi. *Lecytophora* [*Phialophora*] *lignicola* [*R.A.M.*, 27, p. 106] was the dominant species in slime, followed by an undetermined *Cladosporium*.

In spore counts at different places in the pulp system the numbers increased progressively from the grinders to the stock chest. The first chlorination effected a general reduction of the microflora in the raw water, but a repetition of the process did not contribute further to slime control. Blueing fungi, such as *Pullularia pullulans* [loc. cit.] and species of *Alternaria*, *Phialophora*, and *Cladosporium* [cf. ibid., 30, p. 7 *et passim*], were more resistant to chlorine than other organisms. Fungal spores were scarce in the mill air, those of the blueing group being more frequent at the charging floor and deckers.

A comparative investigation of the sources of infection demonstrated the importance of the white water in this capacity [ibid., 30, p. 337]. Probably no actual fungal growth takes place in the white water itself at the prevailing temperatures, but it is supplied with infective material from the slime accretions on the walls of machinery. The ordinary cleansing routine of the plant is inadequate for slime control and requires reinforcement with other measures, such as raising the temperature of the white water system to well over 60° C. and the use of antibiotics and chemical disinfectants [see next abstracts].

Pehrson (S. O.). **Om möjligheten att använda biologiska metoder för förebyggande av röta och blånad i våt mekanisk trämassa.** [On the possibility of applying biological methods for the prevention of rot and blueing in wet mechanical pulp.]—Reprinted from *Norsk Skogind.*, *1948*, 6, 9 pp., 5 figs., 1948. [English summary. Received April, 1951.]

Extensive studies during the last few decades have failed to solve the problem of the control of micro-organisms in wet mechanical pulp [see preceding and next abstracts]. The literature on the subject is reviewed and the various methods proposed are discussed in the light of recent experience. Melin's recommendation of a biological procedure for the control of blueing in groundwood pulp [*R.A.M.*, 13, p. 531; 14, p. 275] formed the basis of experiments at the Swedish Timber Research Institute, Stockholm, the results of which demonstrated the occurrence in wet pulp of some antagonists producing antibiotic substances. One of them, *Aspergillus fumigatus*, appears to be of little practical significance notwithstanding the production by certain strains of four antibiotic substances [ibid., 23, p. 267]. On the other hand, the antibiotic properties of a coliform bacterium, designated *Bacterium* A [ibid., 27, p. 105] may provide a practical means of combating the damage.

Gran (G.) & Pehrson (S. O.). **Organiska kvicksilverföreningar såsom desinfektionsmedel för massa- och pappersindustrien.** [Organic mercury compounds as disinfectants for the pulp and paper industry.]—*Svensk PappTidn.*, 54, pp. 93–95, 1951. [German and English summaries.]

The general properties of organic mercurials are described, and tabulated lists are given of those suitable for the control of micro-organisms in the pulp and paper industry [see preceding abstracts] and available on the Swedish market to-day. The active ingredients with their reputed and actual contents, the form of preparation, manufacturer, and retailer are given. Phenyl mercury acetate is the active ingredient of bufen 30 (Buckman Laboratories, Inc., Memphis, Tennessee), femacell (A/B Ferrosan, Malmö, Sweden), and three pulpasans (KP, F, and FF) [*R.A.M.*, 30, p. 336]; phenyl mercury borate of myocide and myocide DG (Lunevale Products, Ltd., Lancaster, England); pyridyl mercury acetate of pyridose (Mallinckrodt, St. Louis, Missouri); organic fixed mercury of scutamol [loc. cit.] (Imperial Chemical Industries, Manchester); a mixture of phenyl mercury acetate, -borate, and -hydroxide of aamicrosol (C. V. Chemische Fabriek Aagrunol, Groningen, Holland); and methoxy ethyl mercuric chloride of anti-slime (Prochim Corbehem, France).

Khudyakov (Ya. P.) & Voznyakovska (Mme Ya. M.). Чистые культуры микоризных грибов. [Pure cultures of mycorrhizal fungi.]—Микробиология [*Microbiology*], 20, 1, pp. 13–19, 7 figs., 1951.

The authors recommend infection of oak and pine seedlings with pure cultures of mycorrhizal fungi [*R.A.M.*, 30, p. 282] in order to promote the growth of these trees for field-protective afforestation in the Soviet steppes. At the Moscow Section of the Pan-Soviet Agricultural Microbiological Institute pure cultures of *Boletus edulis*, *B. luteus*, *B. variegatus*, *B. luridus* [ibid., 23, p. 369; 25, p. 184; 28, p. 300], and three cultures, grey, yellow, and black, from three kinds of hyphae, all from oak mycorrhiza, proved to be amino-heterotrophic.

Amsler (P.). **Untersuchungen über die wachstumsfördernde Wirkung einiger natürlicher Extrakte auf Ustilago violacea (Pers.) Fuck.** [Studies on the growth-stimulating effect of some natural extracts on *Ustilago violacea* (*Pers.*) Fuck.]—*Mitt. naturf. Ges. Bern*, N.F., 7, pp. 53–96, 4 figs., 11 graphs, 1950.

Using the strain of *Ustilago violacea*, the agent of anther smut of *Melandrium* spp., employed by Schopfer and Blumer [*R.A.M.*, 18, p. 185], the author found that the addition of minute quantities of natural extracts (from wheat seedlings, spinach, *M. album* leaves, and liver) to a synthetic medium containing glucose, asparagine, secondary potassium phosphate, and magnesium sulphate resulted in 40 to 80 per cent. heavier growth than that obtained with vitamin B_1 alone. One of the active principles of the wheat and spinach extract acts in the same way as vitamin B_1 and is indispensable, while the other is supplementary and cannot replace the essential component. It is thought that these growth factors may be closely connected with the vitamin B_1 enzyme system.

Fernández Valiela (M. V.) & Carranza (J. M.). **Verificación de sanidad con respecto a virus en Papas.** [Verification of health in relation to Potato viruses.] —Reprinted from *Inf. Direcc. Invest. agríc., B. Aires*, 3, 31, 8 pp., 7 figs., 1950.

Hitherto there has been no organized system of seed potato certification in Argentina, but plans are now in hand for the annual provision of virus-free material. In 1948 equivalent lots of the varieties Katahdin, White Rose, and Heinkel M.A. were planted in three different regions and in the greenhouse at the Balcarce Experiment Station, the latter being used for inoculation experiments on tobacco

chilli, and *Datura stramonium*. Of 352 Katahdin plants 197 induced no symptoms on these hosts and were accordingly adjudged to be healthy, the corresponding figures for 260 White Rose and 150 Heinkel M.A. being 18 and 135, respectively. Virus X [*R.A.M.*, 30, p. 358] was isolated from practically all the diseased plants; two were infected by virus Y and a few others by undetermined viruses.

These preliminary data are discussed in relation to the performance of each of the three varieties at Balcarce. Katahdin appears frequently to act as a symptomless carrier of virus X; White Rose is 100 per cent. infected; while in the case of Heinkel M.A., either the variety is markedly resistant or the diffusion of virus X in the region of Balcarce is very slow.

Bercks (R.). **Über die X-Virus-Verseuchung des Nachbaues von primärinfizierten Kartoffelpflanzen.** [On the X-virus infection of the progeny of primarily infected Potato plants.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), 2, 10, pp. 147–149, 1950.

Tubers from plants of the potato varieties Flava, Capella, and Frühperle, which had been inoculated in 1949 with virus X [*R.A.M.*, 30, p. 284], were planted [in 1950] in pots in the greenhouse and examined serologically four weeks later, using the 'leaflet method' [ibid., 28, p. 413; 29, p. 377]. All Flava tubers derived from plants inoculated at an early stage (May) with virus from the same variety (Flava-X) [loc. cit.] or Sabina (Sabina-X) were infected. The percentages of infected tubers from plants inoculated in June and July with Flava-X were 45·3 and 16·3, respectively. For tubers from plants inoculated at the same periods with virus X from Erstling [Duke of York], the infection percentages were 80·7, 34·2, and 24·2, respectively. Negligible tuber infection resulted in Flava plants inoculated in June and July with the Cs 35 strain [loc. cit.]. The percentages for Capella tubers from plants inoculated at an early stage with Flava-X, Duke of York-X, Kaiserkrone-X, and Cs 35 were 71·4, 5, 0, and 0, respectively. Early infection of Frühperle parents with Flava-X resulted in 81 per cent. infected tubers and late infection 62 per cent., and with Cs 35, 27, and 10, respectively. The data confirm mature plant resistance to virus X.

Gretchushnikov (A. I.) & Yakovleva (Mme N. N.). Углеводный обмен в раковом наросте у Картофеля. [Carbohydrate metabolism in Potato warts.] —*C. R. Acad. Sci. U.R.S.S.*, N.S., 76, 2, pp. 303–304, 1951.

Further studies in U.S.S.R. [cf. *R.A.M.*, 30, p. 385] demonstrated the decrease of starch and increase of glucose in potato tubers affected by *Synchytrium endobioticum* [loc. cit.] and in the warts. There was an accumulation of free acids in the tumours. Thus, the pH in tuber sprouts of wart-resistant varieties was 6·6 to 7; in those of susceptible varieties 6·2 to 6·4; and in warts 5·2 to 5·4.

Mooi (J. C.). **Het Fusarium-rot droogrot bij Aardappelen.** [The *Fusarium* rot or dry rot of Potatoes.]—*Landbouwk. Tijdschr.*, 62, 9, pp. 712–725, 5 figs., 1950. [English summary.]

Fusarium caeruleum was found to be the most important agent of dry rot of potatoes [*R.A.M.*, 30, p. 385] in Holland in the spring of 1950, following the dry summer and warm early autumn of 1949. The pathogen is a frequent cause of losses among stored potatoes, being particularly troublesome in transit, while *F. avenaceum* [ibid., 25, pp. 13, 182; 27, p. 579] also contributes to the damage. In the recent outbreak *F. caeruleum* gained ingress to the tubers principally through sprouts killed by handling. The Bintje, Record, and Eigenheimer varieties are highly susceptible, while Voran, Zeeburger, and Arenthamer are very resistant. Susceptibility to dry rot is enhanced by prolonged duration of storage, sprouting, and maintenance of a temperature of 5° C. instead of 3°.

The results of treatment with fusarex [ibid., 30, p. 301] have been inconsistent, sprouting being delayed for several weeks in the cold spring of 1950, while in 1949 little or no retardation occurred. The chemical should not be applied earlier than October or November. The use of fusarex on ware potatoes is temporarily prohibited in Holland pending sanction by the National Institute of Public Health after investigation of its poisonous properties.

Scudder (W. T.), Jacob (W. C.), & Thompson (H. C.). **Varietal susceptibility and the effect of potash on the incidence of black spot in Potatoes.**—*Proc. Amer. Soc. hort. Sci.*, 56, pp. 343–348, 1950.

Highly significant reductions in the incidence of internal black spot (also known as blue discoloration and bruise) of potatoes on Long Island [*R.A.M.*, 25, p. 276] were obtained by potash applications, though amounts up to 400 lb. per acre reduced incidence by only 10 to 15 per cent. Similar response resulted from the use of 150 lb. sodium per acre. Certain moist varieties, some of the new introductions resistant to blight [*Phytophthora infestans*], and Chippewa show very little blackening. Further work is in progress.

Saccas (A.). **Un Fusarium parasite des panicules de Riz.** [A *Fusarium* parasitic on Rice panicles.] –*Rev. Bot. appl.*, 30, 335–336, pp. 483–500, 1 fig., 1950.

In 1948 rice fields between Kaou and Kelengou [French Equatorial Africa] became severely affected by a *Fusarium* mould of the panicles. While the grain was still green a discoloured, circular or oval, necrotic spot, surrounded by a dark brown halo, appeared at the glume tip. Not more than 2 mm. in diameter at first, it gradually enlarged until it covered one-third or one-half the surface of the glume. The spots rarely developed on the whole panicle. A white, powdery mycelium appeared on the affected parts, which turned brown, the grain and glumes rapidly becoming covered with a pinkish-white, woolly mycelium. When infection occurred before the ovary was fully developed the grain became shrivelled and empty. When infection occurred late the endosperm appeared to be unaffected although an abundant mycelium was present in it, on the internal walls of the glumes, and on the surface of the pericarp. In seeds infected late the mycelium remained latent, developing only on germination. On bearded varieties the beards were affected. In culture on potato dextrose agar (pH 5·6) the aerial mycelium was abundant, flocculent, cottony, at first loose, later very dense, white or with a pinkish tinge, turning pale straw yellow to dark chamois, sometimes remaining white in patches. Growth was occasionally pulverulent; on some hyphae there were dome-like swellings.

The mycelium covered the surface of the medium in four to five days and that of oat agar in five to six days at 28° C. The plectenchyma was of average thickness, smooth, yellowish, brown or cinnamon yellow, turning dark brown with age. The medium became almost straw yellow. The macroconidia were squat, shorter than on rice panicles, and beaked; the base was nipple-shaped, subconoid, rarely undifferentiated. Sixty per cent. were 3-septate, 13·5 per cent. were 2-septate, 13·5 per cent. 4-septate, and only 4 per cent. 1-septate; none were 6- or 7-septate. The 3-septate measured 31·7 by 4·8 (16·5 to 26·8 by 4·1 to 6·1) μ. The microconidia were mostly uni-, rarely bicellular. No chlamydospores were observed. On rice panicles 5-septate conidia were most frequent (32·4 per cent.); they measured 37·3 by 5·8 μ and the 3-septate ones 25 by 5·2 μ. The fungus is described as a new variety, *F. nivale* var. *oryzae* [without a Latin diagnosis]. It differs from the species in its longer macroconidia and from variety *majus* in the further fact that on rice panicles 5- and 6-septate spores predominate.

The optimum temperature for the germination of the macroconidia lay between 27° and 30° C., while death ensued in 6 to 12 hours in a liquid medium at 39° to 40°. The presence of liquid water was indispensable for germination.

Transverse sections of affected panicles showed that infection occurred at every stage of their growth. Seed containing the mycelium in the endosperm and embryo and sown without being disinfected was destroyed a few days after emergence. Heavily infected grain does not germinate, even after disinfection.

Irrigated rice is very susceptible. The sources of infection are the soil and seed from diseased crops. Control measures recommended are soil disinfection, the destruction of plant debris, and seed immersion for 30 minutes in 0·5 to 1 per cent. commercial formalin (40 per cent. formaldehyde).

Zambettakis (C.). **Une fusariose du panicule du Riz en Oubangui.** [A fusariosis of Rice panicles in Ubangui.]—*Rev. Mycologie, Suppl. colon.*, 15, 2, pp. 106–111, 1 fig., 1 graph, 1950.

A description is given of the macro- and microscopic characters exhibited on various media by *Fusarium nivale* var. *oryzae* isolated from rice panicles in Ubangui, French Equatorial Africa [see preceding abstract].

Wiersma (J. H. N.). **Meeldauwbestrijding bij Rubber.** [Mildew control in Rubber.] —*Bergcultures*, 19, 22, pp. 431, 433, 435, 4 figs., 1950.

Particulars are given of the construction and performance of two motor sprayers recently tested in Java for the control of rubber mildew [*Oidium heveae*: *R.A.M.*, 30, p. 286]. One is supplied by Van Dok and Leenman, Enkhuizen, Holland, and runs on a one-cylinder, 1½ h.p. motor of Massey-Harris manufacture, performing 1,700 to 1,800 revolutions per minute. The other is the Wervelwind [Whirlwind: ibid., 29, p. 538], fitted with a Briggs & Stanton 1½ h.p. benzene motor giving 2,200 r.p.m. with the maximum charge of 10 kg. sulphur dust. Using the Whirlwind, an area of 40 ha. can be treated in 50 minutes with a total of 60 kg. sulphur. Home-produced sulphur being now very inferior in point of fineness to the pre-war 'Cirrus', it may be advisable to resort to foreign brands pending an improvement in local manufacture.

Nikitin (A. A.). **Correcting trace-element deficiencies.**—*Fertilizer Rev.*, 25, 2, pp. 12–14, 4 figs., 1950.

Some useful information has been collected from various sources on the correction of deficiencies of minor elements in the soil and in the plant.

Unpublished results by W. F. Forsee, of the Everglades Experiment Station, Florida, showed that manganese deficiency in some plants was not cured by applications of up to 100 lb. manganese sulphate per acre when the pH of the soil was 6·8, notwithstanding an increase of the element in the leaves from 11·9 to 15·1 p.p.m. He also showed that some crops, e.g., oats and shallu [*Sorghum roxburghii*], in virgin soil responded rapidly to the addition of copper, and no signs of starvation developed if a concentration of 4·6 parts per million and upwards was reached in the leaves. The following concentrations of trace elements per ton of mixed fertilizer [cf. *R.A.M.*, 29, p. 640] are suggested: 20 lb. copper sulphate, 30 lb. manganese sulphate, and 10 lb. each of zinc sulphate, borax, and iron sulphate. They may be added either before or after ammoniation. The solubility of copper and zinc salts varies less than that of manganese, which is substantially increased when added after ammoniation.

Under certain conditions, e.g., in alkaline or acid leachable soils, spraying or dusting with neutral salts of the minor elements may be more successful than soil treatments. Thus, manganese deficiency of groundnuts and boron deficiency of celery and cauliflower have been controlled by dusting of the foliage, while sprays have given good results on beans [*Phaseolus vulgaris*] and maize.

The administration of trace elements must also be considered from the stand-

point of synergistic and antagonistic actions between the various elements. According to G. D. Sherman, of the Hawaii Agricultural Experiment Station, the ratio of iron to manganese is more important than the manganese level of the soil or the uptake of the element by the plant [ibid., 28, p. 358]. An upset in the iron-manganese ratio may result in chlorosis of plants with 500 p.p.m. manganese. In general, normal health will be maintained when the ratio is about 2 to 1.

Janson (B. F.). **A new disease of Dill.**—Abs. in *Phytopathology*, 41, 1, p. 19, 1951.

During the past two years dill (*Anethum graveolens*) crops grown in the same soil in Ohio for several years have been attacked by a destructive root rot and wilt, causing a total loss in some fields. The disease is particularly severe in young seedlings, which suddenly wilt and die. In older plants a gradual yellowing of the basal leaves extends upwards until death ensues. The vascular system of infected plants darkens and the roots decay. The roots and stem bases consistently yielded a species of *Fusarium*, the pathogenicity of which (in monoconidial isolates) ranged from 2 to 100 per cent. The fungus proved innocuous to several hosts closely related to dill. It was effectively combated by steam sterilization of infested soil but not by seed treatment.

Reitsma (J.) & Sloof (Miss W. C.). **Leaf diseases of Clove seedlings, caused by Gloeosporium piperatum E. & E. and Cylindrocladium quinqueseptatum Boedijin et Reitsma.**—*Contr. gen. agric. Res. Sta., Bogor*, 109, pp. 50–59, 3 figs., 1950. [Indonesian summary.]

Gloeosporium piperatum [*R.A.M.*, 17, p. 346] was isolated from the dying leaf tips of clove seedlings and *Cylindrocladium quinqueseptatum* [ibid., 30, p. 346] from circular, whitish, red-bordered spots and irregular, brown patches on the foliage near Bogor, Java, in June, 1942. The lesions produced by the latter fungus may at first be confused with those of *Cephaleuros mycoidea*, but the projecting hairs on the under side of the leaf are missing. The results of inoculation experiments with conidia and mycelium from pure cultures of both fungi (used singly and jointly) demonstrated the severe pathogenicity of *Cylindrocladium quinqueseptatum* under humid conditions. In a dry atmosphere its development was abruptly arrested and the spread of infection within the host greatly retarded. On the other hand, *G. piperatum* attacked only plants that had been mechanically injured or weakened by infection with *C. quinqueseptatum*. Good control has been effected of recent years in a nursery at the Research Station, Bogor, by spraying the seedlings with a solution of 1·5 per cent. Bordeaux mixture as soon as leaf production is well advanced, combined with shading to prevent sunburn lesions and the application of nitrogenous manure at appropriate intervals after the age of four months.

Green (R. J.). **Studies on the host range of the Verticillium that causes wilt of Mentha piperita L.**—*Science*, 113, 2930, pp. 207–208, 1951.

In greenhouse soil inoculation tests with *Verticillium albo-atrum* [*R.A.M.*, 27, p. 356] strain B11B from peppermint (*Mentha piperita*) at Purdue University, Lafayette, Indiana, only *M. rotundifolia* developed the disease out of 21 weeds tested. Of nine economic species inoculated, *V. albo-atrum* was recovered only from six out of 20 Black Beauty eggplants and four out of 20 Calwonder chilli plants. Growth was excellent on debris of *M. piperita* and *Chenopodium album* and moderate on that of potato, tomato, chilli, *Brassica oleracea*, *Amaranthus retroflexus*, *Portulaca oleracea*, and *Oenothera biennis*. In cross-inoculation tests with isolates from nine hosts only No. 119 from tomato and No. 53 from radish infected *M. piperita*. Research is in progress to determine the stability of the various strains of *V. albo-atrum*.

Da Camara (E. de S.). **Mycetes aliquot Lusitaniae. VIII, IX, X.** [Some fungi of Portugal. VIII, IX, X.]—*Agron. lusit.*, 10, 4, pp. 279–320, 2 pl., 1948; 11, 1, pp. 39–73; 3, pp. 165–189, 6 pl., 1949. [Received April, 1951.]

Included in these further contributions to the knowledge of Portuguese fungi [cf. *R.A.M.*, 29, p. 383] are *Puccinia antirrhini* [ibid., 20, p. 136] on *Antirrhinum linkianum*; *Ustilago lupini* n.sp. on lupin (*Lupinus luteus*); *Phomopsis ribatejana* n.sp. on peach; *Septoria chrysanthemella* [ibid., 27, p. 136; 29, pp. 89, 154] (new to the country) on *Chrysanthemum myconis*; *Phoma mespili* (first record for Portugal) on loquat; *Helminthosporium lusitanicum* n.sp. in association with *Anthostoma melanotes* on alder; *Phomopsis pallida* (new to the country) on poplar (*Populus robusta*); and *Vermicularia chaetoplexa* n.sp. on *Ficus elastica*.

Fischer (G. W.). **The smut fungi. A guide to the literature, with bibliography.**—x+387 pp., New York, The Ronald Press Co., 1951. $6.

This book is intended to serve as a guide and rapid introduction to the literature dealing with the biology and control of some 330 species of smut fungi and the diseases they cause [cf. *R.A.M.*, 30, p. 247]. It represents the essential information on the subject contained in 3,353 references listed in the bibliography. Part one (pp. 3–217) is a subject-matter guide to the literature arranged under the fungus species listed in alphabetical order. Where applicable, the literature references are cited alphabetically and chronologically under the headings: control; culture on artificial media; cytology; heterothallism and sex; hybridization and genetics; life-history, parasitism, and factors affecting; longevity of spores; miscellaneous records; physiologic specialization; spore germination and factors affecting; and varietal resistance and susceptibility. In general, the nomenclature and synonymy are taken or adapted from Zundel's manuscript of his proposed monograph 'The Ustilaginales of the World' [cf. ibid., 23, p. 501], and Zundel's disposition of species has also been followed [but see *Mycologia*, 43, 3, p. 267, 1951].

Lindtner (V.). **Gare Jugoslavije (Ustilaginales Jugoslaviae).** [Smuts of Yugoslavia (Ustilaginales of Yugoslavia).]—Reprinted from *Bull. Mus. Hist. nat. Serbe*, Sér. B., *1950*, 3–4, 110 pp., 4 pl., 2 figs., 1950.

Following a historical survey of smut studies in Yugoslavia and elsewhere, and a diagnostic key for 21 genera of Ustilaginales, descriptions are given of 134 species (including one new one) and their distribution in the country. They include *Sphacelotheca sorghi* on sorghum [C.M.I. map No. 220]; *S. panici-miliacei* [*S. destruens*] on *Panicum miliaceum* [ibid., No. 219]; *Tilletia secalis* on rye [see above, p. 408]; *T. triticoides* on wheat; *Ustilago nuda* and *U. hordei* on barley; *U. avenae* on oats; and *U. zeae* [*U. maydis*] on maize. A host index, distribution table, list of specimens in the Mycological Herbarium of the Serbian Natural History Museum, and a four-page bibliography are appended.

Hiratsuka (N.). **Notes on species of the rust fungi collected in the vicinities of Lake Oze and Oze-ga-hara, Nikko National Park (1).**—*J. Jap. Bot.*, 26, 3, pp. 71–77, 1951.

Of the 67 species of Uredinales [cf. *R.A.M.*, 20, p. 136] in this list [with annotations in Japanese], 56 are Melampsoraceae and one is a new species, *Hamaspora ozeenis* on *Rubus pectinellus*.

Viennot-Bourgin (G.). **Urédinées d'Afrique (première note).** [African Uredinales (first note).]—*Rev. Mycologie, Suppl. colon.*, 15, 2, pp. 99–105, 2 figs., 1950.

Notes are given on the morphology and taxonomy of *Diorchidium tricholaenae* collected on *Rhynchelytrum repens* [*R.A.M.*, 25, p. 322] on the Jos Plateau, Nigeria, in December, 1949. Hitherto the uredospores and amphispores have not been

described. They were found in small quantities mixed with the teleutospores in a common sorus. The uredospores, measuring on an average 24·2 by 26·8 μ, were generally polyhedral, rarely globular, and the walls bright reddish-brown, 1 to 1·5 μ, with narrow, slightly protuberant, scattered warts. The insertion point of the pedicel was scarcely definable, but there were four well-spaced, ovoid, germ pores. The regularly ovoid amphispores measured 30·35 by 22 μ on an average. The wall was up to 1·8 μ thick, reaching 4 to 5 μ at the apex which formed a convex cap more densely covered with warts than elsewhere. The spore was borne on a hyaline, persistent pedicel, often prolonged and thickened at the point of insertion. From this study it appears that *D. tricholaenae* presents certain affinities with the genus *Puccinia*. [It was transferred to *P. tricholaenae* by Ramar Krishnan: ibid., 28, p. 32.]

Frezzi (M. J.). **Las especies de 'Phytophthora' en la Argentina.** [The species of *Phytophthora* in Argentina.]—*Rev. Invest. agríc., B. Aires*, 4, 1, pp. 47–133, 29 figs., 1950.

A critically annotated account of the 12 species of *Phytophthora* hitherto recognized in Argentina is preceded by a list of the material examined, the laboratory procedures employed, and a description of the general features of the genus [*R.A.M.*, 28, p. 632], and followed by a synopsis of the characters of the species listed (instead of a dichotomous key), a host index, and a bibliography of 82 titles. Some of the records have already been noticed in this *Review*.

P. cactorum is recorded on grapefruit and *Fatsia japonica*; *P. cactorum* var. *applanata* [ibid., 11, p. 579], not hitherto reported from Argentina, on *Schinus molle* and *Brachychiton populneum*, both new hosts; and *P. capsici* [ibid., 18, p. 85] on cucumber, *Phaseolus lunatus*, and eggplant.

Phytophthora cinnamomi [ibid., 29, p. 235 *et passim*] was isolated from three new hosts, *Pinus radiata*, *Cupressus* sp., and *Thuja* sp., and was found for the first time in Argentina on *Rhododendron* and *Platanus orientalis*.

Phytophthora citrophthora [ibid., 23, p. 296] was isolated from root rots of *Acer negundo*, *Araucaria angustifolia*, *B. acerifolium*, *B. populneum*, *Bauhinia candicans*, chilli, *Capsicum pubescens*, *Celtis australis*, *Cicer arietinum*, and from damping-off of *Poncirus trifoliata*, *Clerodendron* sp., cucumber, *Cucurbita* sp., *Dianthus chinensis*, *Fagara* [*Zanthoxylum*] *coco*, fig, *Gomphrena* sp., ivy, walnut (*Juglans nigra* and *J. regia*), *Vinca rosea*, *Magnolia grandiflora*, *Melia azedarach*, *Pinus halepensis*, *P. pinea*, *P. radiata*, *Robinia pseudo-acacia*, *Salvia splendens*, and tomato.

Phytophthora drechsleri [ibid., 10, p. 755], a new record for Argentina, was isolated from *Chrysanthemum cinerariifolium*, *Celosia plumosa*, *Schinus molle*, *Pelargonium zonale*, tomato, and *Coleus* sp.; and *Phytophthora megasperma* [ibid., 23, p. 294] from lemon, grapefruit, and *Cicer arietinum*.

P. palmivora [ibid., 23, p. 15] was isolated for the first time from *Brachychiton diversifolium*, and *P. parasitica* [ibid., 23, p. 296] from the same host, *Begonia* sp., China aster, safflower, *Celosia plumosa*, *Cryptomeria japonica*, carnation, *D. chinensis*, *Eucalyptus viminalis*, *Fragaria* sp., *Fuchsia* sp., ivy, *Heliotropium peruvianum*, *Impatiens balsamina*, *Magnolia grandiflora*, *Melia azedarach*, *Phaseolus lunatus*, *Pinus halepensis*, pomegranate, *Salvia splendens*, *Schinus molle*, and sesame. The fungus was also found for the first time in Argentina on melon and eggplant.

Phytophthora syringae, with which *P. hibernalis* is regarded as synonymous, was isolated for the first time in Argentina from lemon and navel orange fruits [C.M.I. map No. 47; *R.A.M.*, 30, p. 34].

In the diagnostic synopsis use is made of the growth of the fungus in malachite green [ibid., 21, p. 394] and at 35° C. as differentiating criteria, in addition to morphological characters. Thus, *P. parasitica* is distinguished from *P. palmivora* by its ability to grow at 35° and in malachite green at 1:4,000,000.

Bitancourt (A. A.) & Jenkins (Anna E.). **Estudos sôbre as Miriangiales. I. Dez novas espécies de Elsinoaceas descobertas no Brasil.** [Studies on the Myriangiales. I. Ten new species of Elsinoaceae discovered in Brazil.]—*Arq. Inst. biol., S. Paulo,* 19, 7, pp. 93–109, 3 pl., 1949–50. [English summary.]

Among the species presented in this critically annotated list of new Brazilian Elsinoaceae [see next abstracts] are *Sphaceloma cassiae* on *Cassia splendida* and *C.* sp., and *S. psidii*, the agent of 'spotted anthracnose' of guava, which is characterized by a dark-coloured basal stroma supporting a palisade of densely compact, elongated, non- or uniseptate conidiophores, 30 to 200 by 15 to 30 μ; conidia were not observed. The spots formed on both leaf surfaces are 1 to 3 mm. in diameter, sometimes coalescent, subcircular or irregular, surrounded by a thin, sinuous, slightly elevated, seal brown line, the centre dirty white on the upper and brown on the under side.

Bitancourt (A. A.) & Jenkins (Anna E.). **Estudos sôbre as Miriangiales. II. Vinte novas espécies de Elsinoaceas neotropicais.** [Studies on the Myriangiales. II. Twenty new species of neotropical Elsinoaceae.]—*Arq. Inst. biol., S. Paulo,* 20, 1, pp. 1–28, 7 pl., 1950–1. [English summary.]

The 20 new species of Elsinoaceae from South and Central America and the Dominican Republic described in this paper [see preceding and next abstracts] include *Sphaceloma abutilonis* on *Abutilon striatum*, *Elsinoe diospyri* on persimmon, *E. erythrinae* on *Erythrina crista-galli* and *E. reticulata* (all from Brazil), and *S. manihoticola* on *Manihot glaziovii* from Brazil and Nicaragua and on cassava from the Dominican Republic and Guatemala.

E. diospyri is characterized by globose asci about 28 μ in diameter, containing up to eight hyaline, uni- to biseptate spores (probably triseptate at maturity), 8 to 10 by 4 to 5 μ. It forms on persimmon leaves scattered, circular to irregular spots, 0·5 to 2·5 mm. in diameter, with white to ashen-grey centres and dark chestnut or black margins, sometimes localized near the tips or edges.

The fructifications of *S. manihoticola* measure 40 to 50 μ in diameter and 16 μ in thickness; conidia were not observed. The spots formed at the leaf tips are round or irregular, with a salient margin, the colours of the delicate, translucent, or perforated centre varying between sorghum brown, Hay's brown, dusky drab, and army brown.

Bitancourt (A. A.) & Neto (J. P. da C.). **Elsinoaceas do Rio Grande do Sul, Brasil.** [Elsinoaceae from the Rio Grande do Sul, Brazil.]—*Arq. Inst. biol., S. Paulo,* 20, 2, pp. 29–34, 1 pl., 1950–1. [English summary.]

The nine species of Elsinoaceae [see preceding abstracts] in the herbarium of the Laboratory of Agricultural Biology, State of Rio Grande do Sul, Brazil, include *Elsinoe ampelina* on vine [*R.A.M.*, 26, p. 481], *E. australis* [ibid., 26, p. 304] and *E. fawcetti* [ibid., 28, p. 8] on citrus, *Sphaceloma perseae* on avocado [ibid., 25, p. 350], *S. rosarum* on rose [ibid., 24, p. 441], and *S. meliae* n.sp. forming circular to elongated or irregular, black-bordered, light brown spots with sunken centres, 0·5 to 4 by 0·3 to 3 mm., on the leaves and branches of *Melia azedarach*.

Canter (Hilda M.). **Fungal parasites of the phytoplankton. II (Studies on British Chytrids. XII)**—*Ann. Bot., Lond.*, N.S., 15, 58, pp. 129–156, 4 pl., 14 figs., 1951.

Notes are given on the occurrence and development of several chytridiaceous parasites of planktonic algae [*R.A.M.*, 30, p. 290] newly recorded in the English Lake District [ibid., 28, p. 73] and other localities, together with descriptions of two new species and one new combination.

Gorodskaya (Mme O. S.). Новый метод очистки вируса Табачной мозаики. [New method for the purification of Tobacco mosaic virus.]—Биохимия [*Biochemistry*], 15, 6, pp. 507–508, 1950.

A description is given of a new, simple method for the purification of tobacco mosaic virus [*R.A.M.*, 29, p. 480], which proved as effective as that of Ryjkoff and Gromyko [ibid., 17, p. 708]. It involves two extractions with phosphate buffer (pH 7·2), the relation of the fresh weight of leaves to weight of buffer being 1:1 and 1:0·5 for the two extractions, respectively, followed by sedimentation with 0·2 per cent. rivanol [ibid., 28, p. 550], dialysis for 10 to 12 days in running water, and final extraction with approximately 20 per cent. ammonium sulphate (pH 5·5). The virus was entirely free from pigments and crystallized well.

Steinberg (R. A.). **Amino acid toxicities to Tobacco varieties differing in resistance to black root-rot.**—*Bull. Torrey bot. Cl.*, 78, 3, pp. 227–232, 1951.

At the Bureau of Plant Industry, Beltsville, Maryland, the toxicity of amino acids (40 p.p.m.) to three tobacco varieties (Maryland Medium Broadleaf, Havana 38, and Judy's Pride) susceptible to black root rot (*Thielaviopsis basicola*) and three resistant (Havana 142, Havana 307, and Harrow Velvet) was tested in aseptic culture [cf. *R.A.M.*, 27, p. 263]. The seedlings were grown for four weeks at 25° C. with white fluorescent light of about 500 foot-candles.

All six varieties appeared to be specially sensitive to the action of alanine, hydroxyproline, and serine. The average growth score was in a scale ranging from 0 to 4 (where 0 represents approximately 0 per cent. and 4 corresponds to 100 per cent.) and was 2·73 for the susceptible and 3·33 for the resistant varieties with all the 20 amino acids tested. Isoleucine [loc. cit.] induced symptoms of frenching [ibid., 29, p. 281] in all varieties. Serine, threonine, and valine were definitely more toxic to the susceptible than to the resistant varieties. In general, toxicity to the host cells of free amino acids was positively correlated with susceptibility to *T. basicola*, and their presence in fungal exudates is therefore presumed to weaken the resistance of the plant to disease and so facilitate the invasion of host tissues. If this view be accepted, ordinary metabolites of the fungus, such as amino acids, can exert a localized toxic action on the plant when a marked difference exists between their toxicity to host and pathogen.

Stover (R. H.). **The black rootrot disease of Tobacco. II. Physiologic specialization of Thielaviopsis basicola on Nicotiana tabacum.** *Canad. J. Res.*, Sect. C, 28, 6, pp. 726–738, 2 pl., 4 graphs, 1 map, 1950.

Further studies on tobacco black root rot (*Thielaviopsis basicola*) [cf. *R.A.M.*, 30, p. 200] were carried out at Toronto University, using diseased root material and infested soils from widely separated, representative tobacco-growing areas in Canada and the United States. Throughout the experiments variants arising in culture and differing significantly from the wild type in cultural behaviour showed reduced pathogenicity, the greater the cultural deviation the greater being the reduction in pathogenicity. The optimum conditions for differential pathogenicity tests appeared to be: (1) thorough mixing of the correct amount of inoculum in the soil; (2) the use of young, vigorous seedlings set in the soil one week after infestation; (3) exposure to light equivalent to at least 600 foot-candles and a minimum of a 12-hour day; and (4) temperatures from 18° to 25° C. In evaluating the results of the experiments a root index scale was used on which 25 represented severe infection and 100 no evidence of disease. The various isolates used were grouped as follows: Race I, brown, wild types found in the 'old belt' of Ontario (Harrow), in Ottawa, Quebec, Ohio, and Connecticut; Race II, brown wild types from the 'new belt' of Ontario (Delhi, Newcastle, Simcoe, Copenhagen, and Alliston) and

Kentucky; Race III, all grey wild types from the same areas as Race I; and Race IV, grey wild types from Virginia, the only area in which brown wild type cultures have not yet been found.

The Quebec, Ottawa, and Harrow isolates were more pathogenic to the more resistant varieties Harmony, Resistant Havana 211, Delcrest, Oxford 400, Halley's Special, and Connecticut Havana 38 (root indexes 30 to 80) than the isolates from Simcoe, Newcastle, Kentucky, and Virginia (root indexes 75 to 90). With the less resistant varieties the differences in pathogenicity between isolates become less evident although a slight differential was indicated even in very susceptible varieties. The variety White Mammoth was classified in field tests as completely susceptible to black root rot in Canada and was susceptible to all isolates in these experiments.

MACNEILL (B. H.). **Studies in Septoria lycopersici Speg.**—*Canad. J. Res.*, Sect. C, 28, 6, pp. 645–672, 3 pl., 1 graph, 1950.

These investigations on the biology of *Septoria lycopersici* [*R.A.M.*, 29, p. 439; 30, p. 16] were carried out partly as a co-operative project between the Department of Botany, University of Toronto, and the Horticultural Experiment Station, Vineland, Ontario. There are at least two physiologic races, having both qualitative and quantitative differences in their pathogenicity, but they cannot at present be differentiated on any of the tomato or hybrid lines used. One strain produces large, sporulating lesions on more resistant hosts and is very pathogenic to susceptible ones. The other manifests a lack of virulence, producing few lesions even on susceptible hosts. Other factors such as humidity, temperature [cf. ibid., 28, p. 118], light, and host nutrition, which influence host-parasite interaction, were responsible for further variations in symptom expression particularly in lesion size. If fruiting is inhibited lesions continue to enlarge. Experiments in which Bonny Best tomato plants were sprayed with a spore suspension of *S. lycopersici* and incubated at various humidities indicated that a minimum period of approximately 48 hours at saturation was required to promote germination and stomatal penetration. Not only did the pathogen fail to develop when not initially exposed to a saturated environment, but it was also considerably influenced by a reduction in relative humidity even after the host had been successfully penetrated. Studies on spore germination and the pre-penetration phase suggested that a host-parasite interaction, which was sometimes sufficient to bring about spore germination, occurs before actual penetration. The fungus is intercellular [ibid., 15, p. 65] and, although very closely associated with the cells of the parasitized tissues, no penetration of the walls by haustoria could be detected. No evidence was obtained of an action in advance; a certain measure of host-parasite equilibrium is maintained so that the pathogen is able to complete its life-cycle in 10 days and re-initiate infection. Although this evidence suggests a rather high degree of specialization of parasitism, the nature of the host-parasite association is considerably removed from that of an obligate relationship and renders it practically impossible to place the fungus in any one category which might describe its biological activity.

Inoculation of *Lycopersicon hirsutum* resulted not only in the death of the initially penetrated cells but also in the destruction of the fungus. *L. h.* var. *glabratum* and potato produced non-fruiting lesions in which the fungus was still alive.

DENNETT (R. K.). **The association of resistance to Fusarium wilt and Stemphylium leaf spot in Tomato, Lycopersicon esculentum.**—*Proc. Amer. Soc. hort. Sci.*, 56, pp. 353–357, 1950.

In breeding work at the Hawaii Agricultural Experiment Station tomato seedlings were tested for resistance to *Stemphylium solani* and then for resistance to

Fusarium oxysporum f. [*F. bulbigenum* var.] *lycopersici* [cf. *R.A.M.*, 28, p. 648; 29, p. 540]. Every plant in three coupling phase back-cross populations was classified and the data were combined to give a cross-over value of 36·77±2·41 per cent. between the gene *I* for *Fusarium* resistance and the *Sm* gene for *Stemphylium* resistance.

Wilson (J. D.). **Spray concentrates reduce canning Tomato diseases.**—*Food Packer*, 31, 6, pp. 34–36, 1 fig., 1950.

In trials of high- and low-volume sprays at the Ohio Agricultural Experiment Station in 1949, a comparison was made between applications of 160, 80, and 40 gals. spray per acre for the control of tomato diseases, of which only early blight [*Alternaria solani*] and anthracnose [*Colletotrichum phomoides*: *R.A.M.*, 28, p. 599] were of much consequence during that season. The 160-gal. applications were made at a pressure of 300 lb. per sq. in. and the spray formulation was of the commonly recommended or 'X' concentration of the fungicide in water. The other two concentrations used were applied at a pressure of only 80 lb. In the 80-gal. application the amount of fungicide in each gallon of water was doubled ('2X'), and for the 40-gal. treatment it was quadrupled ('4X'). Precautions were taken to prevent settling of the insoluble fungicides and clogging of the nozzles.

The fungicides were each applied to four plots of eight plants at the three above-mentioned concentrations and rates per acre. They comprised three fixed copper (tribasic, COC-S, and copper A) [ibid., 30, p. 392], two zinc-copper mixtures (crag 658 and cop-o-zink), three ziram products (zerlate, methasan, and zac) [loc. cit.], and both liquid and dry dithane and parzate. The following data represent the average results for all 12 fungicides: 'X', net yield 18·5 tons per acre, 8·7 per cent. anthracnose, 22·9 per cent. foliage dead on 30th September; 2X, 18·7, 9, and 26·7; 4X, 19, 9·3, and 28; and control, 15·4, 17·8, and 45, respectively. The three fixed coppers were found to have given better results at the 4X than at the X concentration in all categories except early blight control. The two copper-zinc compounds were about equal at both concentrations. The organics in both groups were definitely superior in all performance classifications at the X than at the 2X or 4X formulations.

Tomatoes were included in another test in which several vegetables [ibid., 30, p. 8] were sprayed with 160 gals. of an X and 40 gals. of a 4X concentration per acre, using tribasic and zerlate, each combined with DDT and parathion [ibid., 30, p. 348]. The average net yields per acre for the X, 4X, and control plots were 18·8, 19·5, and 17·1 tons per acre, respectively, and anthracnose percentages 4·5, 4·1, and 7·5, respectively.

In a third experiment, using tribasic at 4X with each of three nozzle types, hollow cone, solid cone, and flat or fan-shaped, and at X with a hollow-cone nozzle as a check, the solid-cone nozzle gave somewhat poorer early blight control and a lower green fruit yield than either of the other types. The X formulation gave rather better results in both respects than any of the 4X treatments. It is concluded that low-volume sprays may yield fairly satisfactory control of tomato diseases, but further work is required before this can be recommended for general use.

Culler (Dorothy) & Brown (H. D.). **An attempt to simplify the mold counting techniques used for Tomato products.**—*Proc. Amer. Soc. hort. Sci.*, 56, pp. 327–331, 1950.

In an attempt to eliminate the difficulties and correct the inaccuracies encountered in the official method (Howard mould-counting technique) [*R.A.M.*, 23, p. 267; 30, p. 336] for determining quality in processed tomato products it was found that bleaching the tomato colour so that the mould filaments were rendered

more readily visible enabled consistent counts to be made when H.T.H. (calcium hypochlorite containing 70 per cent. chlorine) was used as the reagent. Nile blue sulphate gave temporary differentiation of fungal filaments, while brom cresol green following boiling with 5 N sodium hydroxide caused a blue stain in the mould filaments. Eight of the most common tomato moulds were used: *Fusarium* [? *bulbigenum* var. *lycopersici*], *Rhizopus* [? *stolonifer*], *Colletotrichum* [? *phomoides*], *Eurotium*, *Septoria*, *Rhizoctonia* [*Corticium* ? *solani*], and *Aspergillus niger*. This appeared to be the most promising technique tested.

Panjan (M.). **Ispitivanje stolbur-a Solanacea i način suzbijanja.** [Investigations into 'stolbur' of the Solanaceae and a method of control.]—*Plant Prot., Beograd, 1950*, 2, pp. 49–58, 5 figs., 1950. [French summary.]

The incidence of woodiness or 'stolbur' of tomatoes caused by tomato big bud virus [*R.A.M.*, 27, p. 48] is widespread in Yugoslavia, especially in dry years. The virus was also found on tobacco (in Dalmatia and Herzegovina), potato, and *Atropa belladona*.

In experiments conducted in 1948 to control the suspected insect vectors, including *Hyalesthes obsoletus*, tomato plots dusted twice with DDT [ibid., 28, p. 252] developed 12 per cent. infection, those dusted three times 3 per cent., the respective numbers for gammexane being 7 and 4 per cent., compared with 20 to 47 per cent. for untreated. Both insecticides injured the plants, though DDT was less toxic. The plants should be dusted before the first symptoms appear.

In inoculation tests *Solanum racemigerum* and its hybrids proved susceptible, while *S. ochroleucum* and *S. douglasii* were resistant.

Biraghi (A.) & Pavari (A.). **I problemi posti dalla Endothia parasitica del Castagno nel bacino del Mediterraneo.** [The problems raised by *Endothia parasitica* on Chestnut in the Mediterranean basin.] *Monti e Boschi, 1950*, 7, pp. 291–300, 1 pl., 5 figs., 1 map, 1950. [French and English summaries.]

After briefly describing the distribution of sweet chestnut in Europe, particularly in the Mediterranean basin, and showing that the area planted in Italy exceeds that for all the other countries of Europe together, the authors review the progress made in investigating the control of *Endothia parasitica* [*R.A.M.*, 30, pp. 127, 252] according to the plan of the Italian government [ibid., 27, p. 265]. This plan comprises four lines of investigation: (1) preventive and curative methods; (2) selection of resistant types of sweet chestnut; (3) introduction of resistant species of oriental chestnuts and their hybrids [ibid., 30, p. 349]; and (4) hybridization.

The preventive and curative methods tested were ineffective and have been discontinued. However, if a very few trees showing very early symptoms are found, their immediate destruction is advisable. Also, when trees are cut for timber, the cut should be made level with the ground; suckers formed during the next three or four years then generally remain healthy.

For the selection of resistant types seedlings are being raised from Italian, Spanish, English, and Austrian varieties for experimental inoculation in due course. Large numbers of oriental chestnut varieties are also being grown, and the best types of *Castanea crenata* are being selected. Grafting resistant Chinese chestnut [*C. mollissima*] on resistant Japanese chestnut [*C. crenata*] was begun in 1950. Selection of wild hybrids of *C. crenata*×*C. sativa* is being carried out, and *C. sativa* is being crossed with oriental chestnuts and their hybrids.

Krstić (M.). **Endothia parasitica** у нашој земљи. [Endothia parasitica in our country.]—*Plant Prot., Beograd, 1950*, 2, pp. 113–116, 1950.

Recently *Endothia parasitica* [see preceding abstract] was observed in a chestnut

grove at Panovetz in the vicinity of Goritza, near the Yugoslav-Italian frontier, this being the first record of the disease in Yugoslavia.

Carter (J. C.). **Dutch Elm disease in Illinois.**—*Plant Dis. Reptr*, 35, 1, p. 56, 1951. [Multilithed.]

Ceratostomella ulmi [*R.A.M.*, 29, p. 605] was isolated from a diseased American elm tree near Mattoon, Illinois, in August, 1950. This is the first report of the disease in this State.

Plumb (G. H.). **Control of Scolytus and DED with concentrated sprays.**—*Trees*, 10, 5, p. 8, 1950.

Spraying experiments were conducted at the Connecticut Agricultural Experiment Station, New Haven, in 1948 and 1949 for the control of *Scolytus multistriatus*, the vector of the Dutch elm disease [*Ceratostomella ulmi*: *R.A.M.*, 29, p. 391; 30, p. 395]. Large elm trees in a severely infected area were given either a dormant and a summer spray with a DDT emulsion at 12·5 and 6·25 per cent., respectively, or one dormant spray only. Industrial-grade xylene was used as solvent and triton z-100 as an emulsifying agent.

In September, 1948, three sprayed trees (2·9 per cent.) were infected, compared with 21 (21 per cent.) untreated. The corresponding numbers in August, 1949, were 9 (8·9) and 39 (38·6). A single dormant application was as effective as two sprays.

Krstić (M.). Одређивање здравственог стања једне преборне Букове састојине. [Determination of the state of health of a selected Beech population.] – *Plant Prot., Beograd, 1950*, 2, pp. 3–23, 5 graphs, 1950. [French summary.]

During an examination of pure beech populations in the Istotchna Boranja forest, Yugoslavia, the author found that the heart-wood of the trees was attacked mainly by *Ungulina fomentaria* [*Fomes fomentarius*: *R.A.M.*, 10, p. 632]. The amount of damage was estimated in strips 10 m. wide, according to a scale at 5 per cent. intervals, and expressed graphically in three different ways. The relation between the numbers of trees affected (I to V) and the volume of diseased wood (1 to 5) expressed as a percentage represents the most convenient method of indicating the condition of a population of trees. In the area inspected it varied between III/2 (3 to 7 per cent.) and IV/4 (12 to 20 per cent.).

Drosdoff (M.) & Lagasse (F. S.). **The effect of some magnesium and calcium fertilizers in a magnesium deficient bearing Tung orchard.**—*Proc. Amer. Soc. hort. Sci.*, 56, pp. 5–11, 1950.

An experiment conducted over a five-year period on a magnesium-deficient bearing tung [*Aleurites fordii*] orchard on Lakeland fine sand near Brooker, Florida [cf. *R.A.M.*, 24, p. 345], showed that magnesium treatments that included calcium were most effective in increasing yields and eliminating foliage symptoms. Calcined magnesite (92 per cent. magnesium) at 2·8 lb. per tree per year for three years was the most effective compound in increasing the magnesium content and effecting recovery of the foliage, but not in increasing yields. It was not completely effective with trees originally showing moderate to severe symptoms, even after five years' treatment.

Mandel. **Vorbeugungsmassnahmen gegen die Kiefernschütte (Lophodermium pinastri).** [Precautionary measures against Pine needle cast (*Lophodermium pinastri*).]—*Forstw.-Holzw.*, 4, 13, pp. 201–202, 1950.

Following an outline of the symptomatology of pine needle cast (*Lophodermium pinastri*) [*R.A.M.*, 12, p. 604 *et passim*] and the life-history of the pathogen, the

writer summarizes some important silvicultural precautions against the development of the disease in Germany. Bordeaux mixture, the only effective fungicide, may be applied if necessary in dry weather from mid-July to September.

Westburg (D. L.). **Cultivating boosts fusiform rust infection.**—*Sth. For. Notes* 69, 4 pp., 1950.

Studies in central Alabama confirmed previous findings that where there is danger of southern fusiform rust infection [*Cronartium fusiforme*: *R.A.M.*, 29, pp. 238, 589–591] the increase in growth gained by cultivating and fertilizing young slash pine [*Pinus caribaea*] plantations is offset by an increase in infection. In the spring of 1945, two plots of slash and loblolly pine [*P. taeda*] seedlings were cultivated and fertilized, one plot of each species being left untreated. Four years later 71 per cent. of the trees survived on the cultivated and fertilized plots and 80 per cent. on the untreated. In the latter from June, 1947, to March, 1950, rusted loblolly and slash pines increased from 2 to 30 per cent. and 6 to 43 per cent., respectively, while in the treated plots they increased from 2 to 32 and from 11 to 67 per cent., respectively.

Rishbeth (J.). **Observations on the biology of Fomes annosus, with particular reference to East Anglian Pine plantations. III. Natural and experimental infection of Pines, and some factors affecting severity of the disease.**—*Ann. Bot., Lond.*, N.S., 15, 58, pp. 221–246, 1 pl., 2 figs., 1951.

Further studies on *Fomes annosus* attacking pines in East Anglia [cf. *R.A.M.*, 30, p. 295] showed that the fungus usually invades apparently healthy undamaged roots, the wood of small roots being reached soon after infection. In large roots the fungus grows extensively on the bark before invading the wood, alkaline soils favouring this type of development. Infections of living roots round infected stumps are more frequent in alkaline than in acid soils, probably owing to there being less competition from other fungi. The fact that the disease is generally more severe on alkaline soils is attributed to the absence of *Trichoderma viride* [loc. cit.], which is antagonistic to *F. annosus*.

Root invasion may be checked by resin production and, to a lesser extent, by meristematic activity. Greater resistance is displayed by older trees and those growing on the edge of the plantation than by young trees and those further inside. The fungus invaded weakened or severed roots far more readily than normal, healthy ones. Roots of young pines were more resistant when watering was heavy than when it was restricted or when trees received rainfall only.

Pine roots were infected experimentally by being placed in contact with inocula and by inserting a sawdust culture of the fungus into the wood. Attempts to secure root infection with basidiospores or to infect the bases of young trees were unsuccessful. The cut ends of young branches showed marked resistance to invasion by basidiospores, and stem wounds in plantations were infected only when the trees were severely weakened by suppression.

Waterlogging rarely occurs in East Anglian plantations and is therefore unlikely to influence the severity of the disease, which is less troublesome where there is a relatively large amount of organic matter at the soil surface. Since the surface layer remains moist during droughts at these sites, the trees may not suffer any great shortage of water and are therefore better able to resist the disease.

An attempt is made to assess the relative importance of factors affecting the activity of *F. annosus* and host resistance.

Bagchee (K.) & Bakshi (B. K.). **Poria monticola Murr. on Chir (Pinus longifolia Roxb.) in India.**—*Nature, Lond.*, 167, 4255, p. 824, 1 fig., 1951.

Isolations at the Forest Research Institute, Dehra Dun, from a brown rot of

sleepers made from chir (*Pinus longifolia*) grown in the Himalayas yielded *Poria monticola* [cf. *R.A.M.*, 22, p. 506; 28, p. 607; 29, p. 3]. A large consignment of chir sleepers was obtained and stored at Dehra Dun in poorly ventilated conditions, and by the end of September, 1949, all were affected by dry rot. Thick hyphal mats developed on the surface and fruit bodies corresponding to those of *P. monticola* occasionally formed. The rot was of the brown, carbonizing type; from it *P. monticola* was cultured. The fungus caused a severe brown rot on chir sapwood blocks in culture flasks, the average loss in weight amounting to 63 per cent. in four months.

Moll (F.). **Der Schutz hölzerner Leitungsmasten mit besonderer Berücksichtigung des Verfahrens nach Kyan.** [The protection of wooden conduction poles with special reference to Kyan's process.]—*Dtsch. Chemiker Z.*, 2, 9–12, pp. 198–203, 1950.

The development of the kyanization process of timber preservation [*R.A.M.*, 29, p. 71] is reviewed in the light of the author's experience and some important contributions to the literature on the subject. The various arguments which have been advanced against the method are considered and rejected as untenable.

Becker (G.). **Neue Erkenntisse über Fluor-Verbindungen im Holzschutz.** [Newly recognized facts concerning fluoride compounds in wood protection.]—*Angew. Chem.*, 62, 16, pp. 382–385, 1 diag., 4 graphs, 1950.

Some recent developments in research on various aspects of timber preservation by fluoride compounds, the most important of the inorganic chemicals used for this purpose in Germany, are summarized and discussed. In agreement with other workers, Schulze *et al.* (*Wiss. Abh. dtsch. Mater Prüf Anst.*, 3, p. 40, 1950) found that the fungicidal thresholds of the sodium, ammonium, potassium, and ammonium hydrogen fluorides and mixtures thereof are approximately equal, with a mean value of 1 kg. per cu. m. wood [*R.A.M.*, 30, p. 296]. The corresponding figure for the similarly equivalent magnesium, zinc, aluminium, and sodium fluosilicates [ibid., 29, p. 595] is 1·4 kg. The fluorides and fluosilicates are definitely more toxic to fungi than inorganic copper, zinc, and chromium compounds or mixtures of the latter and a fluoride. In fact, the fluorides are equalled or surpassed only by mercuric chloride [loc. cit.], thallium compounds, and in the case of certain fungi by arsenic compounds.

Pechmann (H. v.) & Schaile (O.). **Über die Änderung der dynamischen Festigkeit und der chemischen Zusammensetzung des Holzes durch den Angriff holzzerstörender Pilze.** [On the alteration of the dynamic tensile strength and chemical composition of wood by the attack of wood-destroying fungi.]—*Forstw. Zbl.*, 69, 8, pp. 441–466, 7 figs., 1 diag., 9 graphs, 1950.

At the Forestry Research Institute, Munich, using the impact-bending test fully described by Trendelenburg in *Holz Roh-u. Werkstoff*, 1940, the writers determined the effect on the tensile strength and chemical composition of wood of *Coniophora cerebella* [*C. puteana*], *Merulius domesticus* [*M. lacrymans*], *Polyporus vaporarius* [*Poria vaporaria*], *Lenzites abietina*, *L. sepiaria*, *Lentinus squamosus* [*L. lepideus*], *Daedalea quercina*, *Polystictus versicolor*, and *Stereum rugosum*.

The procedure differs from the standard wood-block method of testing preservatives [*R.A.M.*, 14, p. 411 *et passim*] in the use as samples of sticks, 8·5 by 8·5 by 120 mm., cut from knot-free, straight-fibred portions of double stick length and breadth. By this means four nearly uniform sticks are obtained, comprising approximately the same annual rings and thus to a great extent agreeing in their measure of tensile strength. Two sticks of each series are laid on the pure cultures

and the other two placed in flasks over a nutrient solution. Readings are made at intervals of 10 to 50 or 60 days. This technique reduces the period required for determination, as compared with the wood-block method, by 2½ to 3 months, dependable results being obtainable after 50 or even (judging by preliminary experiments with specially important fungi) after 30 days. A further advantage of the impact-bending test is the extreme susceptibility of the samples to every form of fungal infection, which will probably enable threshold values [see preceding abstract] to be more sharply defined than by the standard procedure.

To cite some of the tabulated data, after 50 days the loss of weight and reduction in tensile strength of beech wood attacked by *C. puteana* were 12 and 91 per cent., respectively, the corresponding figures for *M. lacrymans*, *Poria vaporaria*, *Polystictus versicolor*, and *D. quercina* being 15·7 and 96, 12·2 and 94, 13·9 and 66, and 6·9 and 86, respectively. After 40 days spruce wood infected by *C. puteana* had lost 13·3 per cent. of its weight and its tensile strength was diminished by 82 per cent., the corresponding figures (after 50 days) for *M. lacrymans*, *Poria vaporaria*, and *Lenzites abietina* being 8 and 78, 17·7 and 91, 15·1 and 75, and for *L. sepiaria* (after 60 days) 12 and 84, respectively. For pine sapwood attacked for 50 days by *C. puteana*, *Lentinus lepideus*, and *P. vaporaria* the figures were 16·4 and 79, 9·2 and 83, and 16·6 and 93 per cent., respectively.

The cellulose content of spruce wood disorganized by *P. vaporaria* was reduced from 53·6 to 46·9 per cent. and that of beech wood infected by *D. quercina* and *C. puteana* from 49·1 to 44·5 and from 46·1 to 37·8 per cent., respectively. The cellulose and lignin contents of beech wood decomposed by *Polystictus versicolor* fell from 45·4 to 43·5 and from 22·7 to 19·8 per cent., respectively.

Stapleton (Norma M.) & McDermott (L. A.). **The role of the aphids, Brevicoryne brassicae and Myzus persicae, in the spread of Xanthomonas campestris, the causal organism of black rot of Turnips.**—*Canad. J. Res.*, Sect. C, 28, 6, pp. 699–705, 1 pl., 1950.

In experiments carried out in the Department of Bacteriology, Ontario Agricultural College, turnip plants (variety Cannel's Purple King) heavily infested with the aphids *Brevicoryne brassicae* and *Myzus persicae* were inoculated with a virulent strain of the black rot organism, *Xanthomonas campestris* [*R.A.M.*, 24, p. 492], and placed in special cages containing healthy turnip plants. Some of both insect species were allowed to migrate naturally while others were transferred mechanically from the diseased to the healthy plants. Symptoms of black rot did not appear on any of the healthy plants. *X. campestris* was isolated from 15 per cent. of the *B. brassicae* and from less than 1 per cent. of the *M. persicae* taken from diseased plants. Some aphids of both species were infested externally with the bacterium by exposure to cultures, and others were infected internally by feeding them with 0·2 per cent. aqueous dextrose solutions containing *X. campestris*. Although the pathogen was isolated from individuals in both groups none of the aphids in either group was able to infect caged, healthy turnip plants with black rot.

Reitsma (J.) & Sloof (Miss W. C.). **Leaf spot of Beta chiliensis L. caused by Cercospora beticola Sacc.**—*Contr. gen. agric. Res. Sta., Bogor*, 109, pp. 42–49, 3 figs., 1950. [Indonesian summary.]

In April, 1943, leaves of both green and red lines of *Beta chiliensis*, imported the previous year from Japan and sown in an experimental garden near Bogor, Java, were found to be severely infected by *Cercospora beticola*. Although the leaf spot has not been reported from Indonesia [C.M.I. map No. 96], it is undoubtedly common in the country on garden beets. The symptoms of the disease and the morphology of the fungus are briefly described, and the available information on the conditions influencing the disease, sources of infection, and control is

summarized from the relevant literature [cf. *R.A.M.*, 7, p. 694; 8, p. 9; 9, pp. 575, 576; 17, pp. 719, 784, *et passim*].

Hartman (R. T.) & Price (W. C.). **Synergistic effect of plant growth substances and southern Bean mosaic virus.**—*Amer. J. Bot.*, 37, 10, pp. 820–828, 6 figs., 1950.

At the Plant Virus Laboratory, University of Pittsburgh, Bountiful garden beans (*Phaseolus vulgaris*) experimentally inoculated with the ordinary strain of southern bean mosaic virus [*R.A.M.*, 27, p. 403] and a yellow mutant strain (*Arch. Biochem.*, 24, pp. 114–118, 1949) were sprayed under glasshouse conditions with a 500 mg./l. solution of β-naphthoxyacetic acid (B-NOA) twice at an interval of seven days. The results indicated a reduction in virus activity (as determined by the number of lesions produced on half leaves of Kentucky Wonder bean) of 75·4 per cent. in plants sprayed one day after inoculation, and of 12·7 per cent. in plants treated four days after inoculation. Plants treated 15 days after inoculation showed an increase in virus activity of 431 per cent. Adverse effects on the plant were more severe than with either the virus alone or the chemical alone. The addition of a B-NOA solution to extracted sap of virus-infected Bountiful bean plants did not inactivate the virus. It appears that while the treatment inhibited virus multiplication, it also delayed maturation of the host tissues and so prolonged the period during which virus multiplication could take place. Typical symptoms of southern bean mosaic did not appear in inoculated plants treated with 2,4-D, but the virus could be recovered from the plants. Synergistic effects of the virus-growth substance combination were detected. Similar effects were observed when China aster (*Callistephus chinensis*) plants infected with aster yellows virus were treated with B-NOA or 2,4-D.

Graham (J. H.). **Overwintering and association of three bacterial pathogens of Soybean.**—Abs. in *Phytopathology*, 41, 1, p. 14, 1951.

Xanthomonas phaseoli var. *sojensis*, *Pseudomonas glycinea* [*P. glycines*], and *P. tabacum*, the respective agents of bacterial pustule, bacterial blight, and wildfire of soybeans [*R.A.M.*, 29, pp. 549, 550, 586], were found to be seed-borne and to overwinter in diseased leaves in North Carolina. A close association between *X. phaseoli* var. *sojense* and *P. tabacum* was observed in the sequence of pathogenesis, the former preceding the latter on the foliage. In greenhouse and field tests *P. tabacum* infected the leaves primarily through the lesions inhabited by *X. phaseoli* var. *sojense*. Incubated in broth media, *P. tabacum* killed either of the other two bacteria by means of a diffusible substance antagonistic to them.

Barnes (W. C.) & Epps (W. M.). **Some factors related to the expression of resistance of Cucumbers to downy mildew.** *Proc. Amer. Soc. hort. Sci.*, 56, pp. 377–380, 1950.

In cucumber breeding against *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [cf. *R.A.M.*, 28, p. 504; 30, p. 356] during the past ten years at Clemson College Truck Experiment Station, Charleston, South Carolina, it has been observed that physiological age is related to resistance, single plants of breeding lines or varieties that reached senescence early always succumbing earlier than late-maturing ones. Once the fruit begins to mature plants succumb rapidly. Proximity and abundance of inoculum also influenced the expression of resistance; a resistant variety always became affected more rapidly when surrounded by susceptible varieties than when surrounded by other resistant ones. Similarly, a susceptible variety surrounded by resistant ones was attacked more slowly than when adjacent to other susceptible varieties. Under conditions of natural infection resistant varieties showed little or no sporulation, and foci of infection appeared as very small, yellow spots on the

leaves. Exceptions to this rule were noted when inoculum was very abundant and the plants had reached senescence. Resistant varieties did not appear to show full resistance when natural or artificial inoculation provided an abundance of spores. Other evidence demonstrated that even when the disease is prevalent, a resistant variety such as Palmetto may remain virtually immune if isolated and treated with a fungicide.

Faan (H-C.) & Johnson (J.). **Strains of the Cucumber mosaic virus.**—Abs. in *Phytopathology*, 41, 1, p. 11, 1951.

From 360 isolates of the cucumber mosaic virus [*R.A.M.*, 30, p. 135], involving 31 plant genera, from Wisconsin and elsewhere in the United States, eight differing types were selected, on the basis of comparative greenhouse tests on tobacco and other plants, for more exhaustive studies in relation to previously described strains. The physical properties, transmission by *Myzus persicae*, and protective action on *Zinnia* [*elegans*] against Price's No. 6 strain [ibid., 19, p. 6] were similar for all. The reactions of 54 plant species were also similar, but seven others afforded some means of differentiation. Five of the isolates are believed to be pure strains since they were inseparable into two or more component parts by any available methods. A mixture of two types of strain, however, could be separated on the basis of cowpea reaction. Nine of the strains previously described [ibid., 20, p. 334] are accepted as valid, while the status of others, differentiated largely on a geographical or host basis, is regarded as questionable. In the present study minor variations permitted the differentiation of five new strains or substrains of the virus, which is characterized by remarkable constancy.

Boyle (L. W.). **Collar rot of Peanuts, primarily a heat canker.**—Abs. in *Phytopathology*, 41, 1, p. 4, 1951.

Groundnut collar rot is characterized in the field by lesions of rotting tissue at a uniform height on the stems and oriented in one direction, usually west. The fungi isolated from the decayed areas gave negative results in inoculation tests. Typical collar rot symptoms were induced by the exposure of young plants to radiation from a heat lamp. Data obtained in these experiments and in early-season field trials combine to show that solar radiation suffices to burn unprotected stems, especially of seedlings, at soil-level. The point of injury may heal, simulating mechanical or insect damage, or it may contract infection by weak parasites, resulting in collar rot.

Husson (Renée) & Chevaugeon (J.). **Colletotrichum nigrum Ellis et Halstead. Anthracnose du Piment.** [*Colletotrichum nigrum* Ellis & Halstead. Pimento anthracnose.]—*Rev. Mycologie, Suppl. colon.*, 15, 2, Fiche 3, 4 pp., 4 figs., 1950.

Details are given of the synonymy, geographical distribution, host range, symptoms, methods of penetration and transmission, morphology, biology, and control of *Colletotrichum nigrum* [*Glomerella cingulata*: *R.A.M.*, 29, p. 157] causing anthracnose and die-back of pimento [chilli: ibid., 27, p. 464].

Reitsma (J.) & Slooff (Miss W. C.). **Rolfs' Sclerotium disease on Hibiscus sabdariffa L. var. Victor.**—*Contr. gen. agric. Res. Sta., Bogor*, 109, pp. 27–33, 4 figs., 1950. [Indonesian summary.]

A severe attack of *Sclerotium rolfsii* on adult plants of the edible Victor variety of *Hibiscus sabdariffa* is reported from Bogor, Java [*R.A.M.*, 19, p. 221]. Infection developed towards the end of the wet monsoon. The leaves and calyces bore slightly sunken, circular, whitish, red-bordered patches, while several fruits were altogether desiccated and white to brown sclerotia, 0·2 to 1 mm. in diameter,

appeared in profusion on their surfaces and on the fruit stalks. In severe cases the fungus spread from the fruit stalk up and down the shoot, producing a zonate, necrotic area, with a yellowish centre and dark margin. Ultimately the shoot was girdled, and white mycelial strands were observed radiating from the centre of the necrotic area. Desiccation of the shoots and fruits ensued. The feathery mycelium extended rapidly over leaves, shoots, and fruits kept in a closed glass jar for 24 hours and caused a wet rot of the infected tissues, which became discoloured, while the fruits darkened and softened. Healthy shoots and fruits inoculated with sclerotia and incubated under humid conditions showed the first symptoms of infection within 24 hours, and during the next 24 a very abundant, silky-white mycelium, produced by the rapidly germinating sclerotia, developed on most of the inoculated shoots and spread from fruit to fruit. Young plants sustained little damage from the disease. Control measures should be directed towards the reduction of humidity and include planting towards the end of the wet monsoon, adequate surface drainage, clean weeding, wide spacing, and early removal of the lower shoots near or touching the soil. Sun and air should be freely admitted, diseased plants promptly removed and burnt, and the soil treated with 1 per cent. Bordeaux mixture.

Reitsma (J.) & Sloof (Miss W. C.). **Cercospora malayensis on Hibiscus esculentus L.** —*Contr. gen. agric. Res. Sta., Bogor*, 109, pp. 34–38, 3 figs., 1950. [Indonesian summary.]

The authors describe the symptoms of a leaf blight of *Hibiscus esculentus* caused by *Cercospora malayensis* [*R.A.M.*, 13, p. 805], which occurred in widely separated areas of an experimental garden near Bogor, Java, in 1943. On the more severely damaged plot the interveinal areas of the lamina presented a general mosaic-like mottling and convexity of the upper surface, followed by the appearance of brown, necrotic patches, especially along the leaf margin, which merged into broad, dry necrotic zones, resulting in upward curling of the margin. Most of the leaves fell prematurely. The growth of young leaves was retarded by the disease.

The first signs of infection on the less severely damaged plot were yellowish patches in the mesophyll, in the centre of which minute, necrotic spots appeared and gradually expanded into irregular, brown blotches, surrounded by yellow zones. The patches were 1 to 2 cm. in diameter, with a greyish-brown centre and a dark brown margin encircled by a pale area. Ultimately the necrosis extended all over the discoloured portions of the leaf blade, which shrivelled and cracked in the centre, leaving holes. *C. malayensis* was observed on the leaves of both severely and mildly infected plants.

The fungus was accompanied by Cicadellidae on the severely damaged plot. Similar symptoms on cotton attacked by Cicadellidae have been reported from India (*Indian J. Ent.*, 2, p. 124, 1940).

Reitsma (J.) & Sloof (Miss W. C.). **A Pythium disease of Basella rubra.**— *Contr. gen. agric. Res. Sta., Bogor*, 109, pp. 3–7, 5 figs., 1950. [Indonesian summary.]

From the black, shrivelled stalks of a tropical vegetable, *Basella rubra*, in an experimental garden near Bogor, Java, *Pythium butleri* [*P. aphanidermatum*: *R.A.M.*, 8, p. 18; 30, p. 142] was isolated on Thaxter's agar. The authors maintain the distinction between *P. butleri* and *P. aphanidermatum* on the grounds of the sizes of the reproductive organs [ibid., 13, p. 399].

The initial symptoms of infection are small, discoloured, necrotic spots on the epidermis of the younger, rapidly growing parts of the stalk. Subsequently the

pathogen invades the cortex, producing sunken, ellipsoid, discoloured, water-soaked lesions. By the time the underlying tissues are reached the epidermis and cortex have turned black and softened. Under favourable conditions the fungus spreads rapidly through the inner tissues over a distance of several centimetres. In such cases the shoots soon turn black and shrivel, but sometimes the lesions are restricted to elongated patches, with a yellowish-white, sunken centre and black, watersoaked margin.

Inoculation experiments on the young parts of the shoots (up to 20 cm. from the top) resulted in the development of infection, but most of the older stem cuttings survived and made fair growth, while those that had been allowed to produce roots before planting were not attacked.

The cultivation of the affected plants involved the maintenance of moisture in the soil during dry periods and the provision of slight shade. This method is evidently not suitable on *Pythium*-infested soils, on which, however, *B. rubra* may safely be propagated from old stem cuttings (preferably rooted), allowing the plants to climb stakes.

Reitsma (J.) & Slooff (Miss W. C.). **Further investigations on Pythium diseases.** —*Contr. gen. agric. Res. Sta., Bogor*, 109, pp. 12–21, 3 figs., 1950. [Indonesian summary.]

Amaranthus tricolor in plots adjacent to *Basella rubra* near Bogor, Java, were attacked by *Pythium butleri* [*P. aphanidermatum*: *R.A.M.*, 9, p. 89 and preceding abstract], which was isolated from both seedlings and older plants (30 to 40 cm. in height). Collapse followed rotting at the stem base, where a dark grey lesion with a dark centre and a broad, watersoaked margin was formed. The fungus spread both downwards and upwards to several cm. above ground-level. The young shoots emerging from the base were also liable to infection. The invaded parenchyma disintegrated and the plants withered and died, the diseased areas becoming dry and shrivelled. Attack on the younger parts of full-grown plants followed heavy showers, dark, watersoaked patches appearing 10 to 15 cm. from the top. From them longitudinal strands of transparent tissue ran along the stem, which softened and gradually disintegrated, culminating in the breaking-off of the shoot at the site of invasion.

A similar *Pythium* was isolated from sisal [ibid., 12, p. 9]. R. van Eek identified this as *P. aphanidermatum*. His unpublished observations on leaf sag disease of sisal, new to Indonesia on its discovery in 1941, are as follows. The first conspicuous external symptom is a drooping of the older leaves caused by lack of turgidity of the base, which bears a watersoaked patch, gradually darkening and finally turning black. Under favourable conditions the fungus penetrates the heart and death ensues. On several occasions uneven growth was observed, due to partial infection. The disease occurs mainly in the lower parts of the field and in the rows along the irrigation ditches where the soil becomes excessively wet and often waterlogged.

A strain of *P. aphanidermatum* was isolated by the authors from the decayed tap-root and lateral roots of a one-year-old papaw tree [ibid., 20, p. 480; 29, p. 145], but trees with typical foot rot symptoms were all attacked by *Phytophthora palmivora* [ibid., 26, p. 458], the agent of foot rot near Bogor. In inoculation experiments with the strains of *Pythium aphanidermatum* from the various hosts positive results were obtained only on seedlings of *A. tricolor* and on detached leaves of sisal. In experiments in 1941 with the sisal strain, the fungus proved highly pathogenic to its own host, besides severely injuring tobacco, papaw, egg-plant, and chilli seedlings inoculated at the growing point or stem base.

The development of *P. aphanidermatum* may be prevented by the sterilization of infested soil by heat or formalin vapour, or by burning dry grasses on the seed-

beds, the soil used for which should be light, rapidly drying, well-drained, and properly aerated. Early thinning is advisable to avoid overcrowding.

EPPS (W. M.), PATTERSON (J. C.), & FREEMAN (I. E.). **Physiology and parasitism of Sclerotium rolfsii.**—*Phytopathology*, 41, 3, pp. 245–256, 1 fig., 4 graphs, 1951.

Studies on the physiology and parasitism of strains of *Sclerotium rolfsii* [*R.A.M.*, 11, pp. 746, 748; 13, p. 273] isolated from sugar and garden beets, rice, and soy-bean were made in the Biological Department, Camp Detrick, Maryland. The mycelium survived in air-dried, infested wheat seeds for at least a year with little apparent loss in viability when stored under cool, dry conditions (at 7° to 8° C. and 12 to 25 per cent. relative humidity), but lost its viability rapidly when stored in a warm, humid atmosphere. The pathogen was most active in soil at 30° to 35°, and gradually declined as the temperature fell; at 15° or below little activity occurred. The mycelium attacked seeds in soil having a moisture content much lower than that required for their germination.

Of eight host plants tested throughout their period of growth, tomato, cowpea, cotton, soy-bean, broad bean, potato, and sugar beet were highly susceptible to *S. rolfsii* in the seedling stage [ibid., 27, p. 47]. Plants with woody stems and roots rapidly became more resistant as they matured. Only the fleshy roots of sugar beets and similar crops remained highly susceptible throughout the season. Peas were highly resistant even in the seedling stage; sweet potato, groundnut, oat, sweet corn, barley, sorghum, rye, wheat, and rice [ibid., 25, p. 337] were also resistant in the seedling stage. The pathogen failed to survive the winter of 1944–5 in field plots in sufficient quantity to cause visible damage to crops grown there in the following summer. It survived in an active condition for less than two weeks in artificially infested fallow soil both in the field and in the greenhouse, but when substrata such as sugar beet roots or carrots were available in the soil survival was possible over the entire season.

Four strains of *S. rolfsii* were readily distinguished by their mutual aversion in agar plate cultures. They differed slightly but consistently in virulence as measured by the rapidity with which they killed young plants. One strain was morphologically distinct and readily identified by its larger sclerotia.

The *Corticium* stage [ibid., 26, pp. 20, 246] was produced on onion-extract agar, but few basidiospores developed and none germinated.

MATTHEWS (R. E. F.). **Effect of some substituted purines on the development of plant virus infections.**—*Nature, Lond.*, 167, 4257, pp. 892–893, 1951.

The studies here reported were carried out at the Plant Diseases Division, Auckland, New Zealand. The methods used were confined to those applicable on a field scale, the compounds, suspended in water or dissolved in 1 per cent. sodium bicarbonate, being watered on to the soil or sprayed on to the leaves of potted plants in the glasshouse. Most of the work dealt with the effect of guanazolo (5-amino-7-hydroxy-1-V-triazolo (D) pyrimidine) on a strain of lucerne mosaic virus from white clover [*R.A.M.*, 29, p. 29]. This virus was mechanically inoculated to young *Nicotiana glutinosa* plants. All the leaves of the treated plants were sprayed with a 0·1 per cent. suspension of guanazolo in water. Six inoculated unsprayed plants (sap dilution 1 in 10) were all systemically infected after ten days, while six inoculated at 1 in 100 were all infected after 22 days. After 54 days the former had 231 lesions on 24 leaves, as against 97 lesions on plants sprayed three times before inoculation, 23 on those sprayed ten times after, and 21 on those sprayed both before and after (13 sprays). The number of plants out of six in which the virus had moved systemically was, respectively, 6, 3, 2, and 4. The corresponding figures for the 1 in 100 inoculum were 28, 9, 7, and 9 lesions per 24 leaves and 6,

1, 1, and 0 plants in which the virus had moved systemically. No detectable virus was present in symptomless plants.

When tobacco plants were inoculated with the same virus at 1 in 1 the controls developed 1,268 local lesions, and all six plants were systemically infected after five days. Plants sprayed thrice weekly with a 0·1 per cent. suspension of guanazolo before and after inoculation developed no local lesions, and after 23 days no systemic symptoms had appeared. No virus was recovered from the top leaves of any of these plants, though active virus was obtained from three of six inoculated leaves.

A 1 per cent. guanazolo suspension was slightly more effective in suppressing lucerne mosaic virus than 0·1 per cent., while at 0·01 per cent. it had no detectable effect. Two sprays before inoculation only were generally more effective than continued spraying after, though in some experiments the latter gave almost complete control. Guanazolo brought into solution in 1 per cent. sodium bicarbonate was more effective than in aqueous suspension. No effect was obtained with foliar applications of guanazolo when lucerne mosaic virus was transmitted to subterranean clover by *Myzus persicae*, though some control resulted when mechanical inoculation was used.

Guanazolo watered on the soil before plants were inoculated gave about the same degree of suppression of systemic symptoms, but reduction in the number of local lesions was less than following leaf-spraying. Incubating lucerne mosaic virus in expressed sap with 1 per cent. guanazolo for two hours had no detectable effect on infectivity as determined by numbers of local lesions produced on tobacco.

With cucumber mosaic virus in cucumber and pea mosaic virus in peas, guanazolo sprayed on the leaves considerably retarded the development of systemic infection when inoculation was effected mechanically, but had no effect when the virus was transmitted by *M. persicae*. With tomato spotted wilt virus in tomato and *N. glutinosa* and with potato virus X in tobacco guanazolo had no effect.

Guanazolo did not affect the time of appearance of the symptoms of common tobacco mosaic virus in tobacco, but the virus concentration in plants sprayed both before and after inoculation was lower than that in untreated plants during the first 10 to 14 days after infection; after two weeks the concentrations were about the same.

With an aucuba strain of tobacco mosaic in tomato guanazolo delayed the systemic spread of the virus, leaf-spraying being more effective in this respect than soil-watering. In tobacco 2–6–diaminopurine delayed the systemic development of lucerne mosaic virus for a few days and the appearance of local lesions of a ring spot strain of potato virus X for 24 to 48 hours, the lesions produced being of the solid, necrotic type.

Doerr (R.) & Hallauer (C.). **Handbuch der Virusforschung. Ergänzungsband II.** [A handbook of virus research. Supplementary volume II.]—viii+425 pp., 134 figs., 44 diags., 9 graphs, Vienna, Springer-Verlag, 1950. $15.80 (bound $16.80).

Most of the studies in this supplementary volume on virus research [cf. *R.A.M.*, 18, p. 605] are of predominantly medical interest, but phytopathogenic viruses are included in H. Ruska's important contribution to the subject of electron microscopy in virus research (pp. 221–374). Mention may also be made of the sections on technique and application of roll tube cultures by A. E. Feller (pp. 1–9); technique and application of drying of viruses in the frozen state by E. W. Flosdorf (pp. 11–22); and top lighting and dark field microscopy in virus research (pp. 23–45) by M. Kaiser and P. Vonwiller. Each section is followed by a bibliography.